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Press and Die Work on Bicycles.

In few others of the industrial arts has there been such progress in recent years as in the art of working sheet metals into commercial product. In the beginnings of this art the operations of cutting off, blank cutting and forming were exceedingly simple. But the requirements of metal workers have had the effect of focusing the efforts of many minds on the adaptation of the original and primitive methods used in such work to the special needs of various lines of manufacture. A vast number of articles are now made of sheet metal which but a few years ago were produced, or would have been produced, by casting, forging, or in the lathe, boring mill or at the bench. The demand for cheaper goods and the great desirability of uniformity of product and interchangeability of parts have had much to do with the development of these methods. Forming operations, especially, have become in many classes of work very complex, and the art of drawing sheet metals has come to a high state of perfection and usefulness. Automatic machines and auxiliary devices, for feeding sheets and strips of metal into presses, and for other purposes having in view rapidity and economy of production, have been invented and brought into the service.

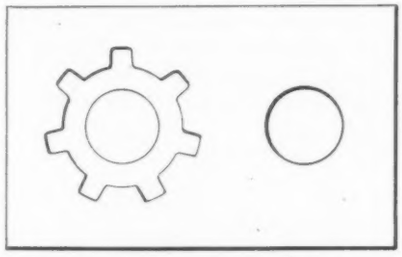

Fig. 1. Blanking Die for Sprocket Wheel

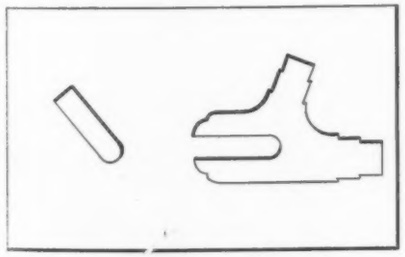

Fig. 2. Blanking Die for Rear Fork End

It is not surprising, then, that in so highly developed a branch of manufacture as the production of bicycles, the student of sheet metal tools and machinery should find a field in which to develop valuable ideas. Some of the parts of a bicycle—such, for instance, as the side piece or pieces of the pedal—would naturally and as a matter of course be made of sheet metal. Other parts which until recently have been made almost exclusively by drop forging and machine finishing, are now made very extensively by press and die operations out of sheet steel. Such are the crank hanger, upper and lower head lugs, seat-post lug, handle-bar tees, fork crown, head binder, etc. Those who advocate making these parts of sheet metal claim that they are equally as strong and serviceable as drop forgings, finish even more uniformly, and have great advantage on the score of economy.

A visit to the factory of the E. W. Bliss Company, in Brooklyn, N. Y., enabled the writer to see a large number of tools for sheet-metal frame connections and other parts in several stages of completion. Full details of the various operations involved it would be impossible to give, mainly on account of their great number and variety, but the general principles may, however, be briefly outlined.

The press operations involved in bicycle work are cutting, drawing and forming. The cutting of the blank which by subsequent operations is to be drawn or formed into shape, is usually a separate operation. As such it is, of course, simple, requiring a punch and die for the punching, and a press of suitable strength and proper dimensions for operating the tools.

Double dies are used for blanking certain parts. The principle of these is shown in Figs. 1 and 2, which show the manner of making dies for rear sprocket and rear fork end. The punch, of course,

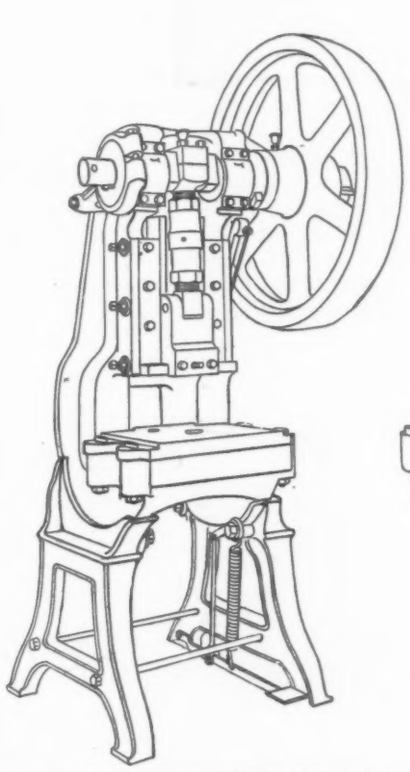

Fig. 3. PRESS FOR BLANKING OPERATIONS.

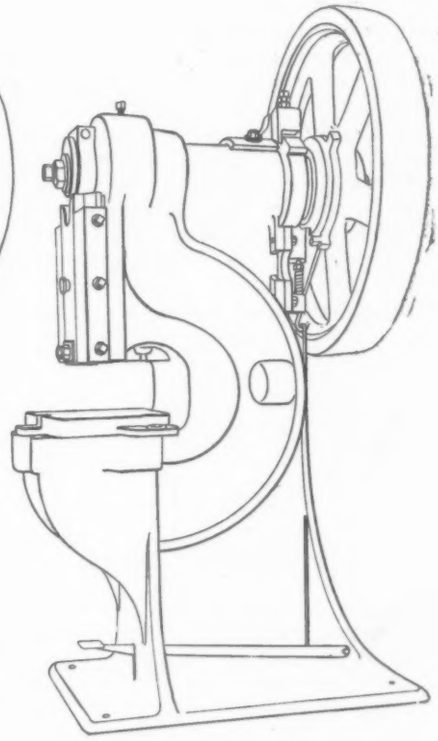

Fig. 4. PRESS FOR BLANKING.

corresponds, and the die is provided with a stripper. For the sprocket wheel the work is fed from right to left, and the center hole is cut out first, and as the strip is set to gage a second time the perimeter is cut, while the same stroke of the press punches another hole. In this

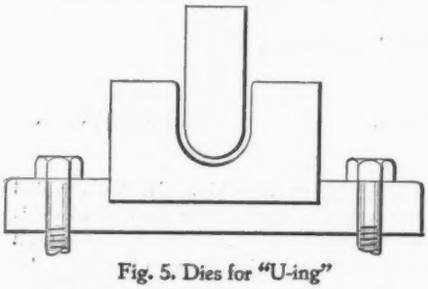

Fig. 5. Dies for "U-ing"

way one complete blank is formed by each stroke of the press except the first and last on the strip. The tools are made in this way for the reason that when the cutting edges have less than a certain space between them the work is distorted and the tools are not durable. Most blanking operations may be done in ordinary cutting and punching presses of the type shown in Figs. 3 and 4. For such heavy work as punching the sprocket blank, however, a powerful geared press is required.

Many of the forming operations on the lighter work are done in moderate-size presses of the type shown in Fig. 3. For others, presses having longer stroke and greater power are required, while regular drawing presses are necessary where drawing operations are involved.

One of the simplest forming operations

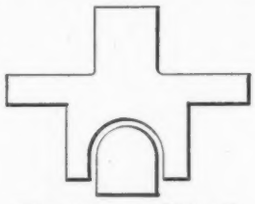

Fig. 6. Dies for "U-ing"

is that of "U-ing" up the strip which forms the sides of a rat-trap pedal. These strips usually have quite a number of perforations, which make necessary a blanking and a perforating operation. The method of forming is shown by Fig. 5. It requires a press with quite a long stroke, in order to push the strip to the bottom of the die. Fig. 6 shows an inversion of this operation, which may be done in a press of shorter stroke, but requires sufficient space between the bed and crosshead of the press to accommodate a "horn bolster." A regular horn press, having single upright column and no bed, but with horn screwed directly into the frame, is convenient for this operation.

Two different methods are employed in making such parts as the head lugs, seat-post lug and handle-bar tee. The first method is indicated by Fig. 7, in which the tube *A* is seamless, being formed from the flat by drawing and reducing operations, while *B* has a seam. The drawn tube *A* has, of course, a bottom, which is cut out in a separate operation.

To produce a head lug, handle-bar tee, seat lug, or similar connection, with one of the tubes seamless, the first operation or operations (as the case may be) are done in drawing presses. Two types of these presses used for bicycle work are shown in Figs. 8 and 9. In the press shown in Fig. 8, the blank holder is actuated by cams, while in the other its motion is imparted through a system of links and toggles.

Fig. 10 shows the first operation to produce the head lug shown in Fig. 7; being done with drawing tools in either the cam or toggle drawing press. The exact

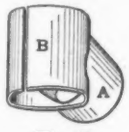

Fig. 7.
A Drawn Heading

number of operations and steps by which a certain result is attained in drawing, reducing and forming, is among the fruits of experiment and must be determined often in that way. Considerable time is often spent in this experimenting before the most perfect results are reached, and it often requires much time and patience to find the blank with which to start to form a particular part.

What Fig. 10 at length comes to by successive operations is shown in Fig. 11. After a final closing operation in such a die as is suggested by Fig. 12, it is ready for brazing.

By the other method of making these parts, no drawing operations are used. The blanks are cut, stamped, and then the tubes are closed on arbors, there being a seam in both of the tubes. The tools for this work are much cheaper than those required for the method by drawing and reducing, and fewer operations are necessary. But there is the disadvantage of considerably more brazing.

Fig. 13 shows part of a two-piece fork crown, which is made by cutting and forming operations, the lugs not being long enough to require drawing.

Fig. 14 shows a one-piece fork crown, which involves cutting, drawing and reducing.

In the crank hanger the seam is sometimes through the top lug and sometimes on the side opposite to it. Fig. 15 shows a Bliss No. 74½ straight-sided press with the tools for one of the operations on a crank hanger.

A special branch of press and die work in the production of the complete bicycle is making side links for chains. For this work automatic feeds are used. Fig. 16 shows a double-roll feed. The left-hand rolls carry the strip into the dies. Double dies are used, the first of which punches the holes and the second cuts the perimeter. An attachment on the slide releases the pressure of the rolls on the stock at every stroke, so that, if the work does not come over the second die

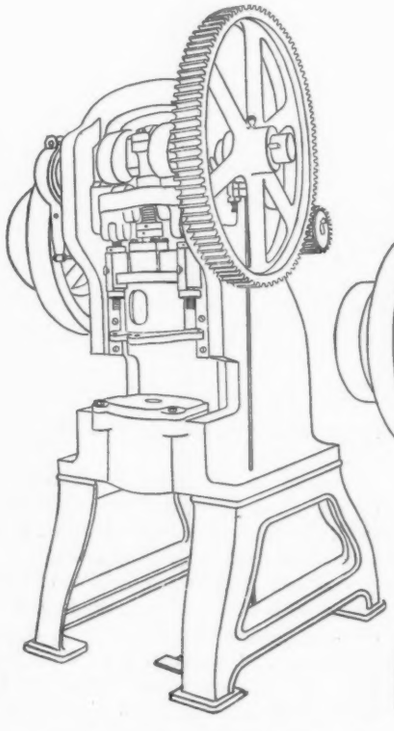

Fig. 8. CAM DRAWING PRESS USED ON BICYCLE WORK.

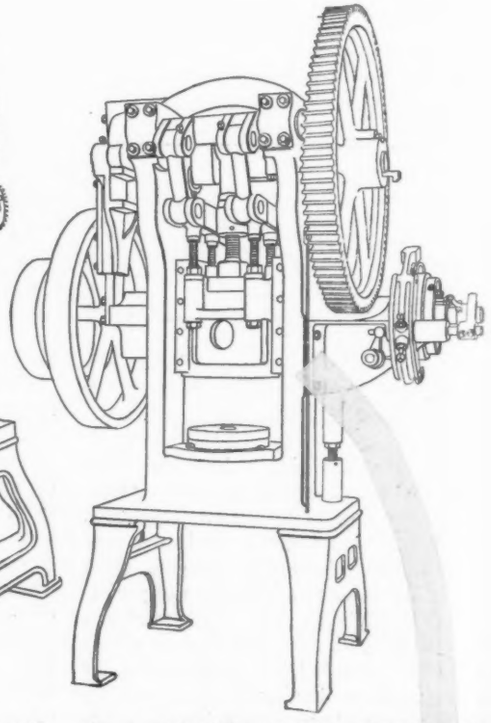

Fig. 9. TOGGLE DRAWING PRESS USED ON BICYCLE WORK.

with absolute accuracy, it may be centered by a pilot pin, with which the cutting die is provided. The rolls at the right carry off the scrap. Single-roll feeds are also used, which operate similarly, but are not provided with the scrap rolls. The double and single roll feeds are used in connection with presses of the types shown in Figs. 3 and 4.

After the links have been punched they

Fig. 10. First Operation for Fig. 7

are sometimes submitted to the action of dies which burnish their edges by pushing them through a highly polished die slightly smaller than the link. They are

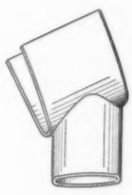

Fig. 11. Made from Fig. 10

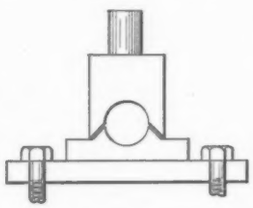

Fig. 12. Forming Dies for Fig. 7

fed into the die by means of a tube feed, shown in Fig. 17. This feed is used in the same class of presses as the roll feeds. It is sometimes made interchangeable with the single-roll feed.

Presses and dies are used for considerable work in connection with the manufacture of bicycles, aside from sheet metal work. Drop forgings are always used for the cranks, generally for sprockets, and by many of the leading and most conservative makers for all frame connections. For these, heavy drop presses are used. The latest model of Stiles forging drop, made by the Bliss Company, was illustrated in the "American Machinist" of May 7th last. For trimming drop forgings, presses of the type shown in Fig. 15, with or without gearing, as the nature of the work demands, are used.

Fig. 18 shows a Bliss No. 39 press, used for saddle-forming at the Mesinger factory in New York. This press will accommodate dies varying greatly in thickness, as the bed is adjustable. The Mesinger saddle is made of very soft leather, underlaid with felt. For sole leather saddles a special form of cam drawing press is used, in which the dies have a long "dwell" on the work and are arranged to be heated by steam or gas.

Fig. 10 shows an attachment for tapering tubes. The tube is clamped in a device which imparts to it a rotary motion, and at the same time a longitudinal advance, thus pushing it into the tapering dies in a manner which insures very perfect work. The attachment is easily removed, making the press available for other work.

For handle-bar bending, a press with long stroke and adjustable bed, similar in general form to that shown in Fig. 18, but heavier, is used. The work is usually done in cast-iron dies, the number of operations required depending upon the curve of the handle bar. To prevent the tubing from smashing at the points where

Fig. 13. Formed Fork Crown

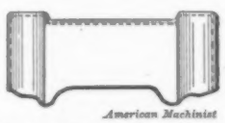

Fig. 14. Drawn Fork Crown

it bends, various devices are used, such as filling with sand, melted resin, steel balls, or inserting a coiled steel spring.

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Government in Russia.

How things are sometimes done in other countries is shown by some translated extracts from the "Frankfurter Zeitung," which we find in the "Literary Digest":

"Mr. Witte, the Russian Minister of Finance, after due deliberation, came to the conclusion that the late St. Petersburg strikes were due to the rapacity of the manufacturers, and that therefore the workmen had cause to be dissatisfied. Mr. Witte summoned a large number of the

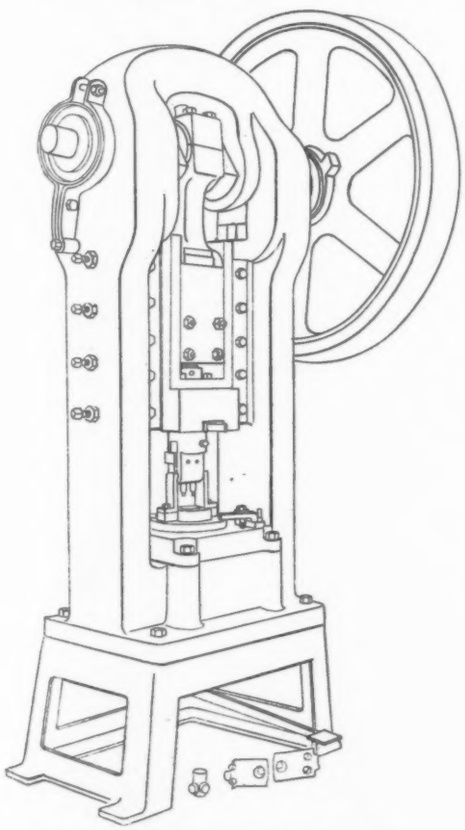

Fig. 15. PRESS WITH TOOLS FOR ONE OPERATION ON A CRANK HANGER.

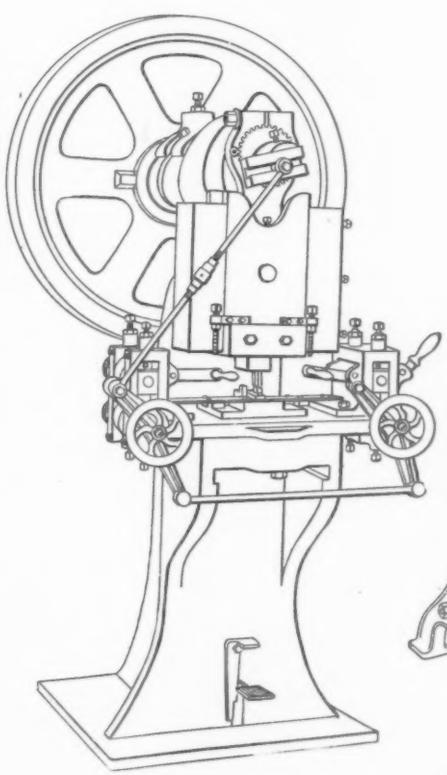

Fig. 16. DOUBLE ROLL FEEDING ATTACHMENT.

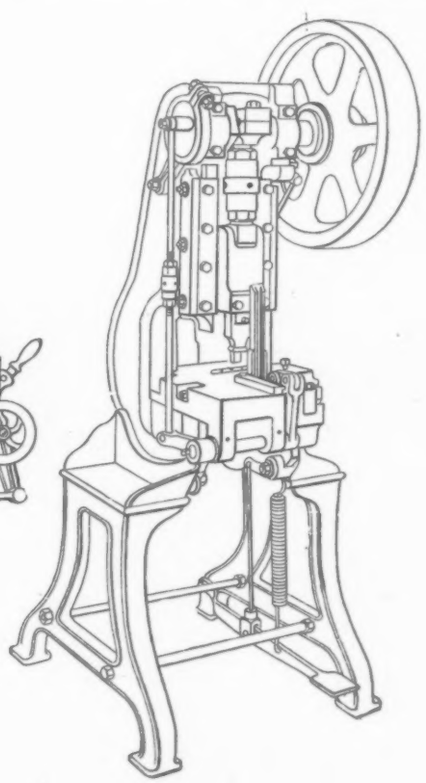

Fig. 17. ATTACHMENT FOR REPUNCHING LINKS.

St. Petersburg manufacturers to inform them that the government did not consider them guiltless. Many of the gentlemen called to appear had been directly concerned in the late strike. The minister saluted them rather coldly, and said:

" 'It is impossible for you to imagine an administration that takes a greater interest in the welfare of industrial enterprise than the present ministry. Our industries are at present protected to such an extent that you need not even fear foreign competition. But, gentlemen, you are mistaken if you fancy that protection has been introduced on your account alone. It is not our purpose to assist you in piling up profits; the government is largely concerned with the condition of the laboring classes. Unfortunately, you do not seem to grasp this, else the late strike would not have occurred. To prove the truth of my assertion, it is only necessary to point out that those establishments whose owners regulated the relation between employer and workman in a more fitting and humane manner were not affected by the strike at all. Unfortunately, the majority of you who are here present do not belong among those whose conduct deserves praise.'

"One of the manufacturers began a speech in defense of his own attitude and that of his fellows. The minister listened for a short time; then he interrupted the speaker with the following remarks:

" 'What you want to tell me is nothing new. I have long since learned all these excuses by heart. But I have not summoned you to hear what *you* have to say. I do not intend to be taught by you. I wanted to let you know what *my* opinion is concerning this question. Good morning!'

"With this the minister bowed rather stiffly and the audience was at an end."

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A good many years ago an American engineer, under the soubriquet or assumed name of "Chordal," wrote a series of articles for the "American Machinist" in narrative form. They contained, beside the exposition of old ideas, a good many bright ones, and they were universally read, copied and eventually published in book form. Since "Chordal's" day there have been many imitators of his style and methods of imparting instruction; so many that it is hardly possible now to take up a technical paper which has not an article in it written in "Chordalese." The shop slang is profuse enough, and the characters, sometimes "the old man," sometimes "Jim" and "Mike," flourish and abound, but the instruction or the ideas conveyed are conspicuous by their absence.—"Engineer," New York.

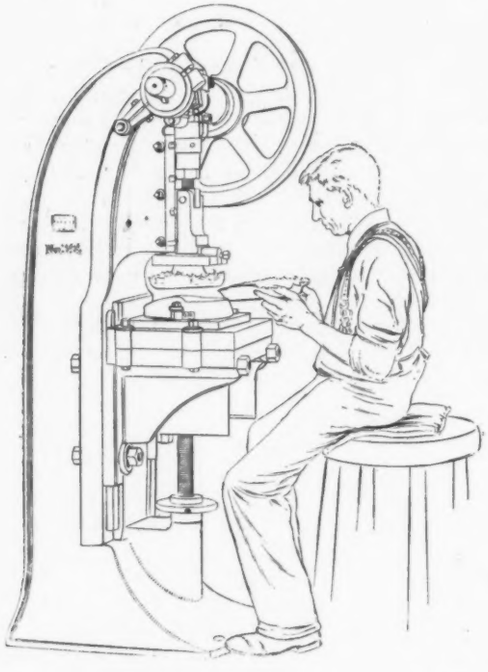

Fig. 18. FORMING SADDLES

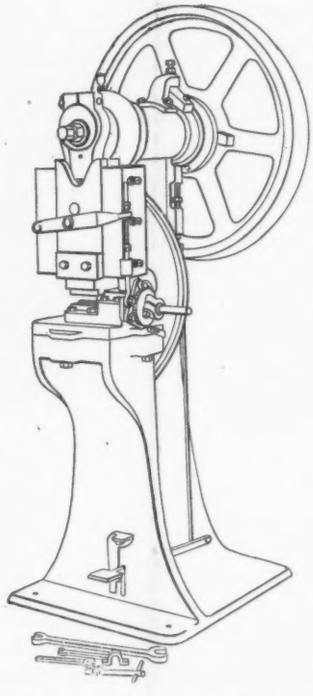

Fig. 19. TUBE-TAPERING ATTACHMENT.

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Broken shafts seem to be epidemic with the Atlantic liners just now, which, of course, means work for the doctors. Within a short time the "Paris," the "Fuerst Bismarck" and the "Anchoria," each of a different line, have reached port disabled in this way. The "New York" also has lately received a new shaft, being held over at Southampton two or three days beyond her sailing time for the purpose. This was only a precautionary matter, we believe, however.

Some Features of a Modern Shop—Casting Storage, Stock Room, Points About Scraping.

Anyone who has read "Chordal," as all good machinists should, readily recognizes in Cincinnati some of the shops he speaks of, that, owing to the high land values and high taxes, have "moved upward instead of moving outward." You find here some of the "very heavy planers running on the high stories of a high shop," only you must make allowance for the fact that what was called a heavy planer in the later seventies appears rather a light planer now, and the heavier ones of today are perforce placed nearer the ground. Perhaps it was one of these shops that Chordal says he once worked in, and which had a lot of floors and "open hatchways through the center of the building; no elevator, mind you, but simply a lot of holes and a hoisting rope!" Chordal worked on the engine floor on the lowest story, nearly under the hatchway, and "never a day passed but something came tumbling down into the space supposed to be reserved for his operations. Today it would be a monkey wrench, tomorrow an oil can, or a dinner bucket, or a lathe chuck, or a portable engine cylinder, or an apprentice, or most anything."

I don't remember that the high and narrow shop in which I first saw the Cincinnati milling machines being made had the open hatchways, but it certainly seemed to possess all the other disadvantages so vividly pictured by Chordal; and the fact that the superintendent, Mr. Holtz, and Mr. Geyer, were able to so manage things there as to make a reputation and money enough to build the better shop they are now in, would make you expect that the new shop would be in some respects noteworthy. It is so, and I am able to present a few photographs that will assist in giving an idea of what the place is like.

Some features of it have been previously referred to in the "American Machinist," but there are others that possess some interest, especially since the recent enlargement.

Though they went quite a long way from the crowded locality in which the old shop stood, they still remain within the city limits, and did not go out far enough to reach land values justifying, in their estimation, a single-floored shop. It has two floors, and I give in Figs. 1 and 2 views of departments on the lower floor, that are characteristic of the order, neatness and system that pervade the entire establishment.

CASTING STORAGE.

We have all heard of the shops built by the man whose foundry could produce castings, and whose machine shop could work them up, but "in the interim between operations there was no place where those castings might rightfully lay

their heads." So they were everywhere and nowhere, and mainly "cluttered" up the machine shop, and it was usually easier and cheaper to order a new casting from the foundry than to find one ready made among the lathes and drill presses, or the partially completed machines, on the erecting floor.

A glance at Fig. 1 will show that castings delivered at this shop not only have a place where they can rightfully lay their heads, but that each individual casting has a certain specified and designated locality assigned to it. If it is a large casting, a certain floor space is reserved for it, and this space is designated by symbols painted on little sign-boards attached to the upper floor timbers, and high enough so that all of them can be seen and read from any position in the room. Under these guide-boards will be found on the floor the heavier castings for the machine indicated, and in the contiguous wall bins the smaller castings for the same machine.

The door at the right leads into the office, and the only irregularity to be seen in the picture results apparently from the fact that the photo was taken at a season of the year when the office stove was not in use and was therefore classed as a casting The larger door back of the man is where the castings come in. The trucks, when driven up to this door, are level with the

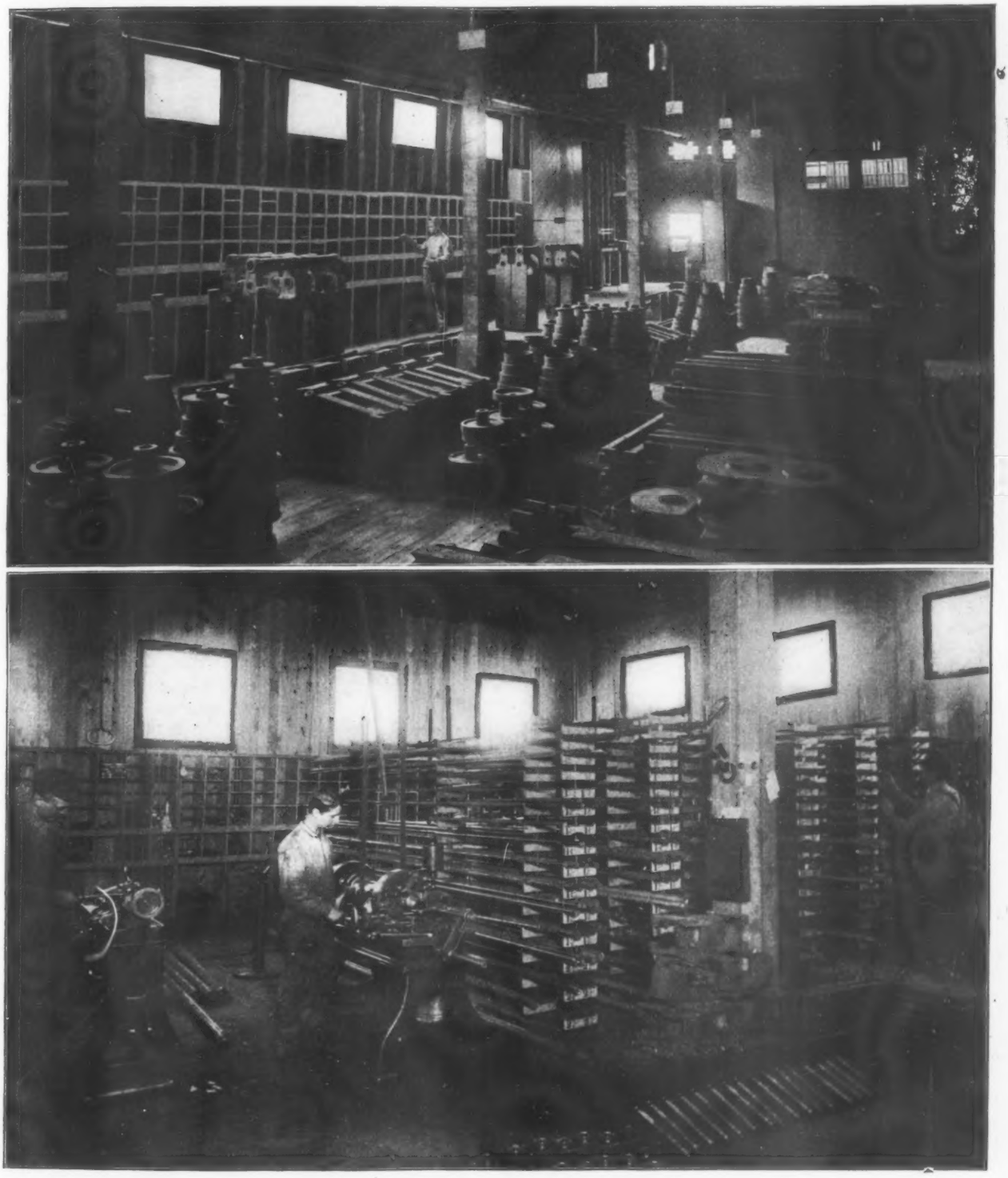

Fig. 1. CASTING STORAGE. Fig. 2. STEEL BAR STORAGE.

casting-storage floor, and an overhead traveler takes the castings and delivers them at any section. The beam of the platform scale by which they are weighed is seen at the right of the door..

When castings are received here, there is no doubt about where they should go, no moving of others to make room for them, and no piling of four tons of castings that won't be needed for a month on top of one that will be needed to-morrow. When a machinist wants one of them, the man who goes for it knows exactly where it will be found, and he can get it without the least difficulty.

STORAGE OF WROUGHT STOCK.

The arrangements for storing bar steel and wrought stock generally are equally systematic, and the room devoted to this is shown at Fig. 2. Standards are fastened to the floor, and to these are fastened, by set-screws, the short supporting arms with upturned ends upon which the bars of stock are laid. Figures designating sizes are painted on these arms, as shown; sizes progress in regular order, and every bar in stock can be readily come at, and its length measured, without removal from the stand. The six stands seen on the floor hold two carloads of stock.

In the bins ranged around the outside of the room are the smaller wrought parts of machines, and in the foreground are the cutting-off and centering machines.

PLANER PRACTICE.

A corner of the machine shop on this same floor is shown at Fig. 3. This corner is devoted to planers. They all rest upon stone foundations independent of the floor, and here are found a number of special fixtures designed to facilitate the work, secure accuracy and economize the labor of both planing and scraping. The work on the planer in the foreground speaks eloquently of the difference in cost between machines built in large numbers and those built one at a time, and the second one shows, in use, a special angle-plate which is carefully scraped square and true to represent the front of the column of the machine. The knees are planed to fit this angle-plate and it is then used to hold the knee on the planer platen while that portion to which the saddle is fitted is planed. Thus, it would be rather more difficult and bothersome for a planer man to get the knees "out of square" than to get them right. In this case a string of pieces all planed at once is not possible for obvious reasons.

FINISHED PART STOCK ROOM.

At Fig. 4 is the stock room for finished parts of machines. At the left, in the cupboards and in assigned places upon the floor, the stock is kept from which the erectors draw their supplies. With each lot of parts there is one piece which is the sample or model by which the others are made. Its various sizes and such other information as is needed are stamped upon it, and it serves the lathesmen and others in lieu of shop drawings or blueprints.

So long as there is an ample supply of finished pieces, this sample is kept with them; but when the stock of any part gets low and it is time to think about making some more of them, the sample is taken out of the bin and put in its appropriate place on the table, seen at the right. This table is divided by partition strips to facilitate classification, and when any given sample is found there it means that as soon as things can be brought around to it some foreman machinist should receive that sample with an order to make a lot of pieces like it.

The condition of the table at the time of my visit, and when the photo was taken, indicates that there is no immediate danger of the shop being run on short time for lack of work.

This arrangement serves to show at a glance what parts are low, and avoids a good deal of unnecessary delay in making shipments for the lack of some part small enough to be overlooked, yet just as necessary as the elevating screw or the cone pulley.

Just outside this stock room, and convenient to it, is the erecting floor, shown in Fig. 5, and at Fig. 6, a corner in which are vise benches and some of the fitting stands which have been previously mentioned, and which seem to afford remarkable facilities for getting at the surface to be scraped in the best possible manner.

SURFACE SCRAPING.

Speaking of scraping, their practice here reminds me that I have long thought it ought to be time for machinists to get over the idea that they can fool each other about the character of a scraped surface and what it represents.

A good many machines go into the hands of men who know little or nothing about scraping, and readily believe that the more ornate the pattern of scraping, the better the artist who did it, and the better the job of scraping must be. But we machinists know better than that, Mr. Editor. We know that a man can take a good sharp scraper, smear a little lard oil over the surface to be scraped, and by skillful manipulation produce a surface that is merely beautiful to look upon; or, rather, it is if the looker don't happen to know that it is simply a fraud, and that the man who did the work had no more conception of what a scraped surface should be than a man has who makes washboards for a living.

It has seemed to me that since machinists generally are "onto" this that we might as well give up the practice of ornamenting scraped surfaces on machines that are to go into the hands of machinists, and follow the example of a few leading builders in leaving these surfaces as they naturally appear after being scraped, with the sole object of making them true and smooth. It may be all right for us to fool the Philistines that buy general machinery, but when we attempt to fool tool-buyers we only fool ourselves, is seems to me.

There is another side to this matter, however, and, wishing to be fair, I will present that also, and the strongest presentation of the other side that I know of is simply to tell what the practice of the Cincinnati Milling Machine Company is, and the philosophy upon which it is based.

To begin with, we must acknowledge that an irregularly scraped or an unadorned scraped surface may be just as much of a fraud, so far as accuracy is concerned, as any other, simply because the work may not be skillfully or conscientiously done.

Fig. 7 gives some idea of how the scraped surfaces on the front of the column of a Cincinnati milling machine look. I asked Mr. Geyer to have it photographed for me, and in the kindness of his heart he has done so, evidently rather against his inclination, being reluctant to have the photograph presented to readers of the "American Machinist" on the ground that it will be misleading, and he says: "It gives the appearance as if the surface was dug out; whereas the purpose of our style of scraping, as you well know, is to get a perfectly smooth surface."

The fact is, however, that the photograph faithfully reproduces the appearance of the scraped surface as it looked to me. The surface is one of those which you instinctively rub the tips of your fingers over to see if it really is composed of a lot of little hills with valleys between them about a quarter of an inch deep, or only appears so. As a matter of fact, it only appears so, and is produced by what to me is a new method of handling the scraper. The scraper is a straight, plain affair, such as is commonly used, but particular pains are taken to have its broad edges precisely straight and very keen. The surface is first carefully scraped true and to a good bearing in the ordinary manner, and I saw this work being done and know that it was well done.

After this the broad scraper was applied and passed over the surface with a motion somewhat suggestive of a boy walking on stilts, only that in going across the surface no part of the scraper's edge was at any time removed from the metal. The scraper being applied in the usual manner, was first swung around in an arc of a circle, one extreme end, or corner, of the edge forming the center upon which it turned; then the corner which had been thus advanced became in its turn the center about which the edge was swung to advance the other corner; and thus, swinging alternately, first on one corner

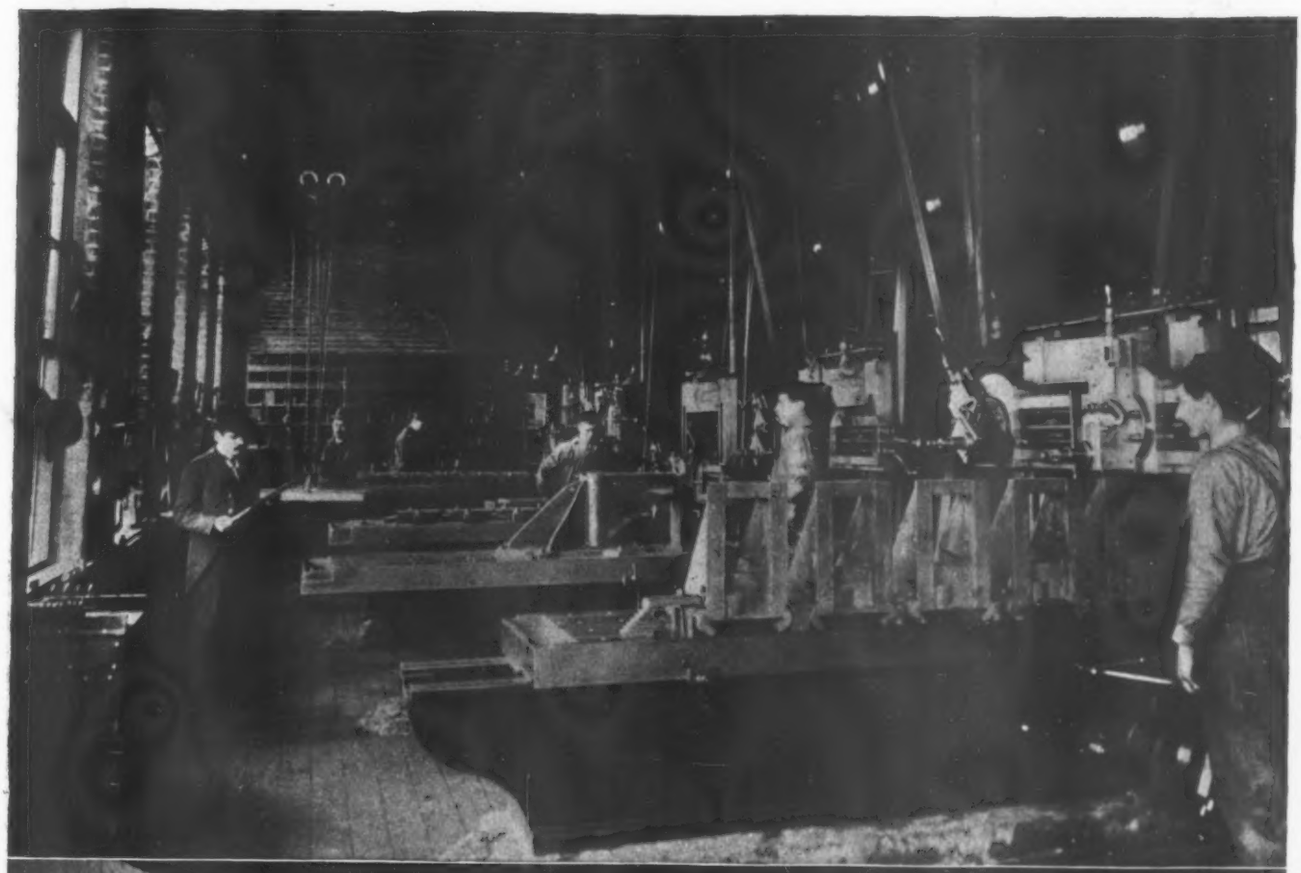

Fig. 3. A GROUP OF PLANERS. Fig. 4. STOCK ROOM FOR FINISHED PARTS.

Fig. 5. ERECTING FLOOR.

Fig. 6. VISE BENCHES AND SCRAPING STANDS.

and then on the other, the scraper was advanced across the surface, taking an exceedingly light cut, yet sufficient to remove the exceedingly small and fine high spots left by the previous orthodox scraping operation, and making the surface marvelously smooth without destroying its accuracy in the least. Mr. Holtz, who gave me an opportunity for satisfying myself on this point, stated as his belief that this final scraping in that manner with a broad scraper did not in the least impair the accurate truth of the surface secured

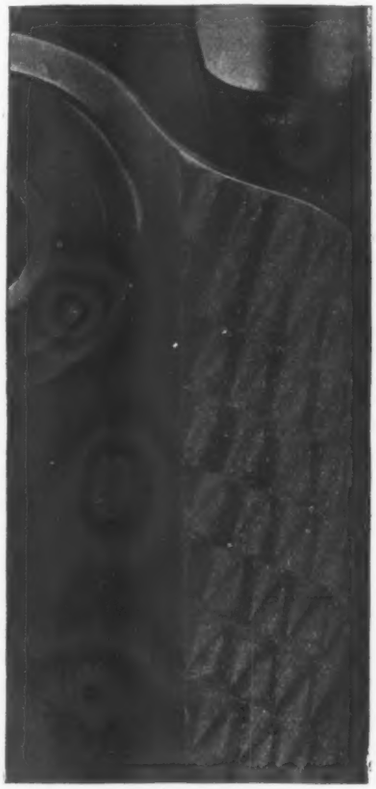

Fig. 7. A SCRAPED SURFACE.

by the previous scraping, and, by removing the small high spots, gave a better bearing surface—a surface better adapted to its purpose than it would otherwise be.

This, however, is ornamental scraping for an entirely different purpose from that which inspires the scraping first referred to, and I don't just see how we are to distinguish between the two kinds, or, in fact, to know much about the character of a scraped surface, unless we see the work done, or test it, or pin our faith to the name-plate. And it is safe to do this last sometimes. What we call "a name" usually has some reason for its existence, and represents careful, conscientious and skillful work in the hands of satisfied customers.

I have recently seen scraping composed of regular squares, each with a Maltese cross in the center. No name-plate could, I think, ever make such scraping look like the genuine article, or look right to a genuine machinist.

S. T. FREELAND.

"Limit" Taps.

If a tap is made straight or truly cylindrical, it must lose its size by becoming smaller from end to end the first time it is put through a piece of metal; not very much smaller, for we know that a straight tap will tap a large number of holes before the threads thus produced become materially under size. But we also know that sometime in the continued use of a straight tap the work it produces will begin to be noticeably undersize, because the tap itself has worn down to a smaller diameter than it originally had, and as this reduction of diameter comes from work, we know it must begin as soon as the work begins, and that, in point of absolute fact, the straight tap must lose its original size in the work of tapping its first hole. With the truly cylindrical form of tap, by far the greater part of its work is done at the leading end, and in consequence it follows, of necessity, that a tap which is originally truly cylindrical must become a taper tap as soon as it has done a certain amount of work, and by the same course of reasoning it is clear that the originally cylindrical tap must become a taper tap as soon as it passes through its first piece of work. All of these conditions and results are perfectly understood by those who have made a study of the matter, and by those who have had an extended experience in attempting to produce tapped holes of uniform diameter in which carefully sized screws will turn with an approximation to uniformity of fit and friction. I do not know of any such thing as the tapping of threaded holes to absolutely uniform size, and do not believe that there can be found in any manufactory screws so nearly to one size, or holes tapped of so nearly a uniform diameter that some screws will not be found much better fits in some holes than others, judged by the hand on the screwdriver, and I am certain that in the case of cycle spoke nipples the work sold by the largest makers is very far from being of uniform thread diameter. I do not believe that internal threads of uniform diameter can ever be produced with a single tap, nor that uniform diameter tapping can ever be done with taps of an originally cylindrical form. I do believe, however, that with taps of the "limit" form, which I shall presently describe, and which is not new, but, on the contrary, very old, although not commonly found in taps offered for sale in the open market, tapped holes may be produced which shall vary in diameter only within fixed limits, and what is more, that this variation limit may be made as small as is desired; which amounts to saying that by the use of the "limit" form of tap, tapped holes may be produced which are substantially of uniform diameter. Before dealing with the "limit" form of tap, it is worth while, for the sake of a full understanding of the action of a tap, to consider the action of a taper tap in work. As each turn of thread of such

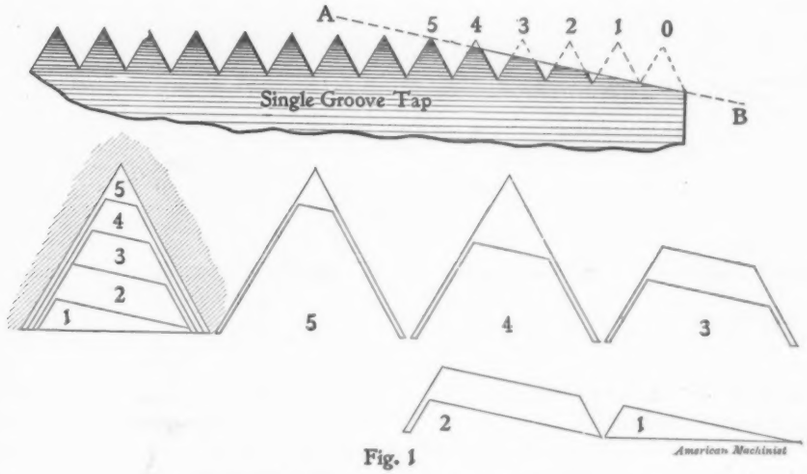

Fig. 1

ILLUSTRATING ACTION OF TAPER TAPS.

a tap is smaller in diameter than the one which follows it, it is obvious that the whole outline of each and every cutting tooth of the tap must remove metal from the nut being tapped as the work of tapping this nut proceeds.

In Fig. 1, let the top figure represent the cutting teeth in the one single groove of the tap; there are commonly four grooves in a tap, but for simplicity of illustration, suppose this tap to have but one groove, and hence but five cutting teeth in the nose of the tap, which is sloped in a straight line and backed off on the slope line *A B* in the usual manner. Then, because this tap is taper, every part of the outline of tooth 2 is farther away from the axis of the tap than tooth 1, and every part of the outline of tooth 3 is farther away from the axis of the tap than that of tooth 2, and so on, tooth 5 being farthest out of all; hence, the angular sides as well as the tops of the teeth must always be in cut when the tap is at work. Consequently, the successive chips cut by teeth 1, 2, 3, 4 and 5 as the tap ad-

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Fred J. Miller, Editor.

Frank Richards,
F. A. Halsey,
Edward P. Buffet,
} Associate Editors.

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Space in advertising pages only is for sale.

We invite correspondence on subjects pertaining to machinery.

Name and address must always be given, though not necessarily published.

Communications for or relating to the reading columns should be addressed to the Editor. All business communications should be addressed to the Company.

Subscribers can have their mailing address changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once. Date on wrapper denotes week with which subscription expires.

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Foreign Trade Requires the Best Goods.

In conversation with a representative of one of our manufacturers of specialties in machine tools for manufacturing operations, who has enjoyed a large trade with European countries for some years past, and who prides himself especially upon the advanced character of his product, the statement was made that some of his best and most advanced work had been made for European customers, and had met with a better reception in Europe than here.

At first sight this condition of things seems entirely anomalous, but the explanation of it is simple. Making a specialty of a few lines of goods, as he does, this manufacturer naturally claims to know more about the possibilities of his machines than customers as a rule can. Nevertheless, these customers, as is usual with the users of machines, think themselves well informed, and when negotiating for machines they insist upon having their own ideas worked into the design and otherwise put limits upon the maker's freedom in designing. In the case of foreign customers, the machines are sold more largely on the reputation of the builder, and the two parties to the trade being separated in time and space, the tendency is far more to order a machine for a given purpose, and then to allow the designer free scope in working out the means for producing the results sought. In other words, in the case of domestic trade, the designer is restricted by reason of the purchaser being at his elbow; whereas the foreign customer, being at a distance, has less to say regarding the plan and details of the machine being bought. It is needless to say that a thoroughly competent builder can produce better results when unrestricted, than when tied down to restrictions and ideas of which he does not approve.

In one sense these are conditions under which extremes meet. We have all heard of unscrupulous dealers who, when filling an order from a distant customer, take advantage of the fact that his distance renders him in a measure without recourse, and supply him with any inferior goods that can be made the basis of a bill. In a case like the present, where the manufacturer has a personal pride in his product, combined with ability and desire to do advanced work, the results are quite the opposite.

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Credit and Pay for Shop Inventions and Improvements.

"At a manufactory in Baden for agricultural machinery the practice has been adopted that when any improvements or any labor-saving machines are introduced, the men's wages are not regulated so as only to leave them the same pay as before, but as a rule about half the profits arising out of the improvements are given to the men. This arrangement has proved very satisfactory, inasmuch as it induces the men to do their utmost and to tax their own ingenuity and intellect, to the joint advantage of themselves and their employers. In addition to this, the new system has made it possible to reduce the number of men by as much as 20 per cent."

The above we clip from "Engineering." It contains an important lesson which some men have learned, but which most of us utterly fail to appreciate.

If you talk with the average shop manager about doing such a thing, he says: "That is all right in theory, but it won't work. My competitors do not divide with their employés the savings effected by improvements in machinery and processes made in the works, and I pay a man a good salary for studying such matters. If I am to remain in business I must take advantage of all improvements as they are made in order to meet competition in prices. Otherwise my competitors who do this will have an advantage which will sooner or later prove fatal to me."

This seems perfectly logical, but, like much other current reasoning on economic subjects, is superficial and entirely ignores important modifying considerations.

It has been proven over and over again that no one man can see all the chances for improvements about an industrial establishment, and make the improvements as opportunity offers. No matter how able a superintendent or a foreman may be as an inventor of improved devices and methods, it is almost always true that the men who do the work can suggest improvements pertaining to their own department of it, which improvements would not be thought of by anyone else.

Of two shops, one managed by a man, himself skillful and inventive, but resentful or jealous of suggestions from employés; the other by a man not so skillful or inventive, but with equal executive ability, and with that kind of tact that calls out the hearty co-operation of employés and makes them feel that good suggestions will be appreciated, acted upon and acknowledged; we would much rather pin our faith to the success of the last-named establishment. It will, other things being equal, have the best appliances for doing work; these appliances will be handled by men interested in their success; the best men—the men most capable of making good suggestions—will be attracted to that shop; they will get the highest wages, but will turn out the lowest-cost work, and the best work.

In some shops the men suggest nothing; they simply do what they receive orders to do, and do it in the specified or usual manner. If you talk with the men who work in such a shop they will usually tell you that all the satisfaction or reward they get for improvements or suggestions is to hear the superintendent or the foreman claim the credit for them when showing the proprietor or a director about the shop.

The men in such a shop cannot be expected to take an interest in it; it would be contrary to human nature. Not only will they decline to make improvements of their own, but they will also give only a perfunctory service in the use of "the boss's" improvements, and will usually be a little better pleased to see them fail than succeed.

Sometimes the narrow-mindedness of a foreman stands in the way of enlightenment on these lines. Being narrow-minded and of very ordinary or perhaps no ability, he is all the time fearful that some of his men, by showing greater ability, will get ahead of and displace him; overlooking the fact that this very narrow-mindedness and jealousy is the most effective known method of repelling good men, arousing their antagonism, and making the shop management a failure.

We know of one large establishment where this difficulty is avoided by having locked boxes with slit openings, into which the employés are invited to drop written and sketched suggestions. These are taken by the proprietor, and, when necessary, handed to various heads of departments for reports upon them. The employé is protected by a dated copy of his suggestion, which he can keep, and in case of a decision adverse to his proposed improvement, can, if he so elects, be heard in advocacy of it; while if it is approved,

its origin is a matter of record, and its originator is duly credited and rewarded.

We have many establishments here in which the fact is well understood that an important part of successful shop management is to recognize that there is such a thing as human nature, and that it is much better and easier to go "with the grain" in these matters than against it; but, on the other hand, we have others where there seems not to be the faintest glimmer of light on this important matter.

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The "Texas."

Again our battle-ship "Texas" has distinguished herself, this time by sinking in a dock at the Brooklyn Navy Yard, and sinking so quickly, in spite of so-called water-tight doors, and pumps, as to demonstrate that if the accident had occurred at sea the ship would have been lost, and probably most of her crew with her.

At this writing little is definitely known about the cause of the accident, further than that something gave way and allowed water to pour through an injection pipe, in a 13-inch stream, into the engine compartment, and that the so-called watertight bulkheads did not prevent this water from flooding other compartments and quickly sinking the ship.

We do not know that the origin of the "Texas" has anything to do with the matter, nor that a similar accident might not occur in the case of any other of our naval vessels; but it is interesting to note, nevertheless, that the "Texas" is really of a somewhat hodge-podge design—originally purchased in England at the instigation of "the line," and then "modified" and "improved" here. Perhaps we shall know all about the accident and its causes when the "Court of Inquiry" makes its report; and then, again, perhaps we won't.

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The Engineers' Club of New York will soon be prepared to entertain its members and friends in much better style than heretofore, it having acquired a lease of a house at 374 Fifth avenue, between Thirty-fifth and Thirty-sixth streets. It is expected that the club will spend about $20,000 in improvements on the property.

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Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer questions by mail.

(195) C. M., Brooklyn, N. Y., writes: I am using an 800-pound drop, dropping it about 14 inches, with no foundation of any account under it, the ground being solid. Have no trouble with hammer, but have had some complaints about the jar and noise, principally the noise. A foundation of concrete and timber on end will, I presume, absorb some of the jar (am I right?), but will it lessen the noise? A.—We think you are right regarding the absorption of jar, but do not think the noise will be lessened; in fact, it may be increased, in our opinion.

(196) A. B. writes: I saw the following question and answer in the "S—— A——": "All things being equal in both cases (that is, speed, load propelled and distance traveled), would the strain on the bicycle chains differ if one bicycle is geared at 70 and one at 80 inches? Would there be any difference in the strain on the chain if the front and the hind gears are transposed, other conditions being equal? A.—For equal work, as you state, the strain on the chain increases with the increase in the gear; 80 gear exerts a harder pull on the chain than 70 gear. By transposing the gear, the strain would be less on the chain by the difference in the relations of the sprockets." Is that answer right? A.—No. Whether a higher gear causes more stress upon a chain or not depends upon how the higher gear is obtained. If it is done by a smaller sprocket on the rear wheel, then the stress will be proportionately increased with the same load and speed, but practically it will remain the same, because the rider will in either case exert at times his full strength and impose the same stress upon chain so long as length of cranks and size of large sprocket remain the same. If higher gear is obtained by enlarging the crank sprocket, then with same load and speeds the stress on chain will not be altered, but the maximum stress that can be put onto the chain by a given rider will be reduced unless the cranks are lengthened to correspond. It is not true that 80 gear exerts a harder pull on the chain than 70 gear. With a given load going up a given grade at a given speed, that chain will be strained most that moves slowest, or, in other words, runs over the smallest rear sprocket, regardless of the gear of the machine. With a given pressure upon the pedals, and equal length of cranks, that chain will be strained least that runs over the largest crank sprocket, regardless of the gear of the machine.

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Business Specials.

Transient Advertisements 40 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Gear wheels, gear cutting. Grant: see page 14.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Ct.

Milling Machs. Kempsmith Co., Milwaukee, Wis.

Engine Castings ⅛ to 2 H. P. Finished boilers and engines. Grant Sipp, Paterson, N. J.

Presses and dies for bar and sheet metal work. Ferracute Machine Company, Bridgeton, N. J.

Just Issued—Catalog No. 8. Mailed free. Clayton Air Compressor Works, 28 Cortlandt st., New York.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

Patent Soliciting of High Class.—D. Walter Brown, Counsel in Patent Cases, 111 Broadway, New York. Send for "Brief History of Patent Legislation."

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The annual meeting of the Society of Naval Architects and Marine Engineers took place in this city last week, and was a well-attended and successful meeting, the engineer element being, however, not perhaps so prominent as in previous meetings, the marine architect being more prominent. Secretary of the Navy Herbert made an address at the dinner of the society, in which he stated that the American Navy was in excellent shape, and said that whenever it might be called upon it would be found to be on the alert, ready for its work, whatever and wherever that work might be. It seems a little ungracious for us to express doubts regarding this matter; but the fact is that there are those whose judgment in this matter we would much prefer to depend upon, who consider that there are alarming points of weakness in our navy, and that its personnel and organization are not such as to insure the highest efficiency. It is a well-known fact that there is a clique among the line officers which seeks to dominate everything and everybody connected with the navy. We believe it dominates Secretary Herbert himself, and it certainly undertakes to prevent, and does prevent, engineers from securing their plain and clear rights as citizens and as naval officers. If we know anything at all about the conditions necessary to naval efficiency, we would say that this is an element of decided weakness, notwithstanding what Secretary Herbert may think of it.

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Though it was at first reported that the Myers ballot machine worked entirely satisfactorily in Rochester, N. Y., at the recent Election, it is now stated that the City Council refuses to pay for the machines on the ground that they do not insure a secret ballot, but that the inspectors of election standing near the machines can tell by the clicking of the mechanism whether a man votes a straight or split ticket.

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It is reported that thirty manufacturers of bolts and nuts have recently held a meeting at Pittsburgh, Pa., and have effected an agreement under which the output and prices will be regulated. The combination thus formed is something similar to that which controls nail production.

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Commercial Review.

NEW YORK, SATURDAY EVENING, NOV. 14TH.

WHAT THE "BOOM" REALLY AMOUNTS TO.

The daily press have exerted themselves during the week following Election Day, in stirring up the market so as to bring anything in the line of renewed activity to the surface. The specific reports they have given may be taken as in the main correct. While it is not unlikely that the impression which these have tended to produce upon the public mind is an exaggerated one, there is little question that the tone of business is better than it was. Trade is likely to spread out gradually. A boom is an abnormal affair, and we may be better off without it.

In order to understand the case, it seems necessary to distinguish between the manufacturing and the selling ends of the various industrial establishments. The former has, in numerous instances, set its machinery in motion, or has increased its force or its hours of labor; which means that for the purpose of executing

orders that have been waiting, contingent upon the Election, or of accumulating stock, or upon general principles, it considers itself justified in so doing. The market moves more slowly. Some of the new activity may indeed be the result of actual new orders, but to get all the wheels of business in motion is a slow matter. The bearings of the market are in the sales-room, and some friction has here to be overcome before it begins to race.

IRON WORKING MACHINERY.

We have made the attempt to find out how the machine-tool interests centering in Liberty street feel about business, and upon the result some of the foregoing ideas are based. Machine-tool factories, however, have not been conspicuous among those reported as taking steps to increase their output, although some, we know, have done so. Perhaps this is because, owing to the export trade, they were busier, to start with, than some others, such as the iron mills; and it is said that their policy would not generally be to pile up stocks of tools before orders came in.

The actual business among machine-tool sellers in this city shows a little improvement. The majority of those with whom we have communicated are finding either more actual trade or more inquiry. At the same time, the tone assumed is generally a conservative one. A distinct betterment in surrounding business conditions is seen, and a recognition on the part of buyers that the time of forced aloofness from the market is at an end; but trade is advancing cautiously and without a rush.

The business which is actually apparent seems not to have polarized about any particular department of work but to include the ordinary run of tools, of which the largest are not the most in demand. From the reports which were published regarding increased work in railroad shops, we were inclined to think that these would be clamorous among the early buyers, but such has not been the case.

WOOD WORKING MACHINERY

shows here and there signs of activity, though some of its votaries are feeling a little blue. A number of the shops where it is manufactured have increased their operations. We happen to know that not in every case are the manufacturers as exuberant over business as this fact might imply, but that the average condition of the business is improved is probably safe to affirm.

MISCELLANEOUS REPORTS.

The various car-wheel works of John H. Bass had, up to November 12th, taken in more than $500,000 worth of orders since the Election.

The Clayton Air Compressor Works have closed a contract for twenty-five air compressors and twenty-five receivers of medium and small sizes, and during the first week of November they sold five air compressors. They think that the business indications in their line are favorable.

Resumptions and increases of output by mills, shops, etc., reported throughout the country, are being tabulated by some of the newspapers. The "Journal of Commerce," New York, which is doing so systematically, has accumulated, up to this morning's issue, the names of nearly 300 mills resuming, 100 of them being engaged in iron and steel work, and 7 machinery; and 217 which have increased force or output, 77 of them being iron and steel, and 19 machinery

The electric companies which have extended their work include the General Electric, Westinghouse and Walker.

SEPTEMBER MACHINERY EXPORTS.

The "Monthly Summary of Finance and Commerce," for September, issued by the United States Treasury Department, shows the following: Exports of domestic machinery—sewing machines, engines, boilers, locomotives, etc., included—for the month of September, 1896, amounted to $2,357,537, as compared with $1,381,745 for September, 1895. The report for August, 1896, showed $2,208,165. For this year up to, and including September, the amount is $18,097,908, against $12,174,557 for the corresponding portion of last year. (In comparing the figures, it is to be borne in mind that since July 1, 1896, have been included printing presses and typewriters; which, together for September, 1896, amounted to $158,784.)

THE IRON MARKET,

though more conspicuous on account of the many resumptions by mills and furnaces than of an actual increase in sales, is reported by local authorities to show a fair amount of business, with an improvement since the Election.

Quotations.

NEW YORK, Monday, November 16th.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$12 50 @ $13 00
No. 2 foundry, Northern	11 50 @ 12 00
No. 2 plain, Northern	11 25 @ 11 50
Gray Forge	11 00 @ 11 50
No. 1 foundry, Southern	12 25 @ 12 50
No. 2 foundry, Southern	11 50 @ 11 75
No. 3 foundry, Southern	11 25 @ 11 50
No. 1 soft, Southern	11 75 @ 12 00
No. 2 soft, Southern	11 25 @ 11 50
Foundry forge, or No. 4 Southern	10 75 @ 11 00

Bar Iron—Base—Mill price, in carloads, on dock; common, 1.15 @ 1.20c.; refined, 1.25 @ 1.50c. Store prices: common, 1.40 @ 1.50c.; refined, 1.50 @ 1.80c.

Tool Steel—Ordinary sizes, standard quality, 5 @ 7c.; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—The "combine" meets to-day and an advance from the old prices of 1.65 @ 1.70c. for ordinary brands from store is expected.

Cold Rolled Steel Shafting—Base size in carloads, about 2½c.; 2¾c. for smaller quantities from store.

Copper—Carload lots, Lake Superior ingot, 11⅜; electrolytic, 11¼c.; casting copper 11⅛c.

Pig Tin—For 5 and 10-ton lots, 13.10 @ 13.20c., f.o.b.

Pig Lead—In carload lots, 2.95c., f. o. b.

Spelter—In carload lots, New York delivery, 4.20c., f. o. b.

Antimony—Cookson's, 7¼ @ 7½c.; Hallett's, 65c.

Lard Oil—Prime city, present make, commercial quality, in carload lots, 44 @ 45c.

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Manufactures.

Des Moines, Ia., will erect a large municipal lighting plant.

Brewster Bros. are about to erect a new steam saw mill at Norwood.

Scott Bros. Electric Co., Detroit, Mich., have decided to increase their power plant.

Waverly, Minn., will construct a modern water system and an electrical lighting plant.

The Paxton Rolling Mills, Harrisburg, Pa., will place a flanging machine, steam tanks, etc.

The Automatic Electric Pump Company is to erect a factory at East Braintree, Mass., at once.

The United States Carriage Company, Columbus, O., will rebuild the factory gutted by fire recently.

The Caseville Electric Light Co., of Caseville, Mich., have decided to increase their power plant.

The York Haven Paper Co., York Haven, Pa., will install new machinery in their chamois factory.

The East Lebanon Iron Co., Lebanon, Pa., will at once erect a new mill, and install engines, shears, etc.

The Globe Brass Works, Detroit, Mich., capital

(*Continued on page 37.*)

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Help Wanted.

Situation and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

TO SUBSCRIBERS

whose names appear on our subscription list, this paper will give two free insertions under this heading to those in want of positions. The advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

Compt. draftsman wants pos. E. P., AM. MACH.

Help Wanted—Good pay for leisure hours. Geo. W. Lord, Philadelphia, Pa.

Successful man wants position as superintendent or foreman. BOX 147, AMERICAN MACHINIST.

Wanted—A first-class exp'nced boring mill hand. Apply to The Royal Electric Co., Montreal, P. Q.

Wanted—Position by a foreman boiler maker; a hustler. Address BOX 155, AMERICAN MACHINIST.

Draftsman, 5 yrs.' exp., tech. grad., wants pos. 3 or 4 days each week. BOX 171, AMER. MACHINIST.

Experienced mechanical draftsman wants position; best references. BOX 169, AMER. MACHINIST.

Competent draftsman wants position; 10 years' experience; references. BOX 170, AM. MACHINIST.

A first-class pattern maker wants position; a young man with experience on machine tools, etc. BOX 154, AMERICAN MACHINIST.

Wanted—Position by competent pattern maker who can handle men and get out work to advantage. BOX 166, AMERICAN MACHINIST.

Wanted—First-class machine tool salesman for Chicago house; good opening for right man. Address BOX 163, AMERICAN MACHINIST.

Practical and successful designer, A 1 draftsman, 20 years' varied experience, designer of high grade engines, desires position. Box 263, Ridgway, Pa.

A technical graduate with 10 years' shop and drawingroom experience, would like a pos. as ass't sup't with growing concern. BOX 165, AM. MACH.

Wanted—A first-class machinist (tool hand) and capable of taking charge of general work when necessary; must be married and have steady habits. BOX 157, AMERICAN MACHINIST.

A foundry foreman with considerable experience on marine, stationary and pumping engines, a good hustler, and can furnish references, now open for engagement. BOX 161, AMERICAN MACHINIST.

Mechanical engineer wishes to change; qualified in managing help, 15 yrs.' exp. as machinist and designing of marine & stationary engs., power plants, general and special machy. BOX 159, AM. MACH.

A young man, energetic and capable, desires position as tool maker or foreman, having had charge of help in cycle factory; similiar position preferred; steady and sober. BOX 141, AMERICAN MACHINIST.

A practical and exp'd eng'r, mach'st and draftsman, familiar with mach. shop practice, mill & fact. const., etc., desires engagement with firm requiring such a man; moderate salary. BOX 125, AM. MACH.

Superintendent, thoroughly experienced on eng., boiler, mining and general mach'y and manufacturing work, under 40, strictly temperate, would like to make a change January 1. BOX 164, AM. MACH.

Wanted—By an up-to-date machinist who has had 20 years' experience, situation as foreman or assistant superintendent; has had experience in handling men with good results; best of reference BOX 152, AMERICAN MACHINIST.

Foreman would like to correspond with Corliss engine builder who wants foundry foreman; experienced in all branches of the business; good references; will pay personal visit if desired; write for particulars. Box 160, AMERICAN MACHINIST.

Advertiser wishes position with some manf'g concern to develop self-starting and reversible oil engine, patent No. 569,672, specially adapted to car, carriage and boat propulsion and stationary service. Address Box 151, AMERICAN MACHINIST.

Wanted—Position by experienced engineer, technical graduate, specialist in design and erection of machine tools and hydraulic machinery can superintend erection, take charge of design or of drafting room. Box 167, AMERICAN MACHINIST.

Supt., 17 years' exper.; 5 in ch'g tool and gauge rooms, 8 supt., Corliss engs., gen. machy., interchangeable wk., ingenious, foundryman, designer, advanced pusher, 34, married, temperate, will change December 1. Box 153, AMER. MACHINIST.

Wanted—Position as foreman or superintendent with cycle manfg. company; good designer and d'ftsman and extensive mechanical abilities, latest methods for producing at lowest costs; 18 yrs.' exp. in gen. tool work; A 1 refs. Box 158, AM. MACH.

Wanted—Position as superintendent of bicycle manufactory; 19 years' experience; practical machinist and tool maker; can design tools, jigs, etc.; also have had large experience building typewriters, etc. Address Box 150, AMER. MACHINIST.

A practical tool maker with a thorough technical education and several years' successful experience in designing & sup'tend'g the manufacture of light mach'y, hardware, tinware, bicycles and registers, wishes to make a change. Box 142, AMER. MACH.

Wanted—A technically educated steam engineer, experienced in designing, selling and erecting power and lighting plants. Applicants will kindly forward outline of exp. and refs., as only those with records will be considered. Box 156, AMER. MACH.

Wanted—A superintendent in a machine shop in a Western city; business twenty years established; line to be changed to gas and gasoline engines, which have been thoroughly and satisfactorily tested. Address, with full particulars, ability, salary, education, etc., Box 162, AMERICAN MACHINIST.

Owing to a consolidation of business, a successful mechanical superintendent will be at liberty January 1st. Experienced in general shop and business management, costs, interchangeable work, tools, gauges, etc.; also general machinery and brass and iron work for steam, gas and water; strictly temperate and reliable; eight years in present position. Add. Box 168, AMER. MACHINIST.

▲ ▲ ▲

Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d h'd lathes & planers. S. M. York, Clev'd, O.

Calipers & Gauges. F. A. Welles, Milwaukee, Wis.

Best and cheapest Bolt Header, made by Baush & Harris Machine Tool Co., Springfield, Mass.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

For Sale—Second-hand drill presses, engine lathes & planers. Dietz, Schumacher & Boye, Cincinnati, O.

We make a specialty of Shartle's patent safety set collars. Prices low and samples free. Middletown Machine Co., Middletown, Ohio.

Wanted—Addresses of foremen of press rooms working sheet metal, with name of firm where employed. These will be treated as confidential. Address "Foreman," care AMERICAN MACHINIST.

We offer an exceedingly fine lot of first-class second-hand machinery, lathes, planers, shapers, drills, millers, screw machines, etc. Call, or get list 17 B. The Garvin Mach. Co., 440 Canal st., N. Y.

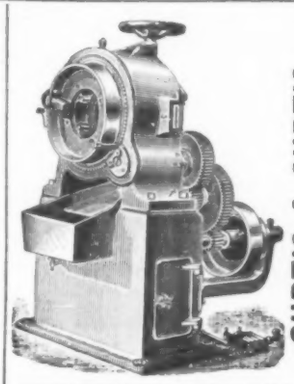
Wanted—An Idea. Who can think o some simple thing to patent? Protect your ideas; they may bring you wealth. Write John Wedderburn & Co., Patent Attorneys, Washington, D. C., for their $1,800 prize offered to inventors.

Patents PROCURED or NO CHARGE for service. *22 Years' Practice.* RELIABLE SERVICE at MODERATE RATES. Daily attendance in Patent Office. Good References.
CHAS. J. GOOCH, Attorney, 615 F Street, N. W., **WASHINGTON, D. C.**

RECEIVER'S SALE.

Complete modern Bicycle Plant. Forty to fifty wheels per day capacity. A going plant, less than one year old. Consisting of the most modern machinery, also parts finished and in course of construction. Good medium grade wheel, several thousand of which have been sold. Sale to take place at the factory, 1,453 to 1,459 Niagara Street, Buffalo, N. Y., on December 2, 1896, at ten o'clock in the forenoon. For further particulars and schedule of inventory, address

JOHN T. McLAUGHLIN, RECEIVER,
No. 55, Erie Co. Savings Bank Building, Buffalo, N. Y.



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FOR HAND OR POWER.
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in the City of New York.

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Four years' undergraduate courses and special facilities for graduate work in all departments. Circulars forwarded on application to the Secretary of the University.

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By a first-class firm for the sole sale of Tool-manufacturing Machines and Tools.

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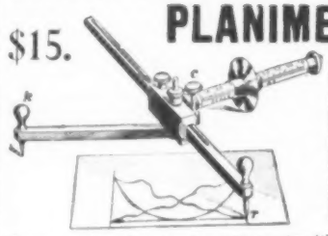

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Reads M. E. P. Direct.
AN "1896" Instrument and up-to-date.

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PORTABLE KEY-SEATER.

In designing this machine our aim has been
John T. Burr & Son.
First,—To produce a machine which shall be powerful, portable, rapid and accurate.
Second,—To make our price so low that it
John T. Burr & Son.
can be afforded even if only occasionally used.

Our machine will cut a 12-inch key-seat on
John T. Burr & Son
the end of a shaft or in the middle without re-setting. That means time saved and a perfect key-seat. Circular free. Gives all details.
No. 9th St. and Kent Ave., Brooklyn, N. Y.

(*Continued from page 36.*)

$10,000, will erect a brass goods manufacturing plant.

Dr. Wm. H. Johnson, Brightwood, Ind., will erect and equip an electric lighting plant at a cost of $10,000.

Mr. H. W. Fowler, of Chicago, Ill., has projected a plan for the erection of a large smelting plant at Ouray, Col.

The Centennial Mills Company, of Spokane, Wash., will build a 1,000 barrel flour mill here at Seattle, Wash., to grind almost exclusively for the Japan trade.

An addition will be made to the Blandon Rolling Mill, Blandon, Pa., which, when completed, will give employment to 30 more men.

The Modoc Mill, Ward, Col., has shut down to permit of the enlarging of the plant to the extent of two new 60 horse power boilers.

The new steam sawmill in West Carthage, N. Y., is being rapidly pushed to completion. The new mill will be 30 feet wide and 110 feet long.

G. S. Buzzell, Cherry River, Pa., has decided to rebuild a new saw mill on the same site as his other mill. The erection of same is rapidly progressing.

A large wire nail mill will be erected in Raynham, Mass. New and improved machinery will be installed. Andrew R. Bassett, of Raynham, is interested.

The General Electric Company, Schenectady, N. Y., has been making arrangements to extend its plant in that city and to increase its capacity by 5,000 hands.

Conrad Werra, of Manitowoc, Wis., has decided to establish a factory and machine shop at Two Rivers, and will open for business about the first of the year.

J. W. Penney & Sons, Mechanic Falls, Me., are building an addition (14 x 110 feet) to their foundry —their trade, which has increased considerably, demanding more room.

S. Severance, bolt manufacturer, Pittsburgh, Pa., is making a number of improvements to his steam plant, and will install two 125-horse power boilers, engine, heater, pump, etc.

J. W. Penney & Son, founders and machinists, Mechanic Falls, Me., are building an addition to their machine shop that will give about 1,400 square feet additional floor space.

The United Milling Company, of Syracuse, N. Y., of which John G. Murphy, of the Grand Union Hotel, New York city, is president, will erect a new factory at Elmira, N. Y.

T. G. Patterson will build a four-story brick factory and mill, costing $40,000, on the east side of Eleventh avenue, between Twentieth and Twenty-first streets, New York, N. Y.

The Union Carpet Lining Company, of East Watertown, Mass., is building a large addition, 50 x 130 feet, three stories high, to be devoted to the manufacture of comforters.

A company has purchased a lot of land at Brunswick, Mass., with the intention of erecting buildings for the purpose of manufacturing electric machinery and doing foundry work.

Superintendent Thos. J. Bray, of the Ohio Tube Co., states that the Beaver Tin Company, at Lisbon, O., will enlarge its plant by the addition of two mills, employing 50 more men.

The Howland Mills Corporation, New Bedford, Mass., has asked leave to erect an addition to the boiler house of that plant. It is to be built of brick and will be 40 x 18 feet, 32 feet high.

A new hub and spoke factory is being built at Sarnia, Canada, which it is expected will be completed and running by January. It will be equipped with the most up-to-date machinery.

The Canton Rolling Mill Company, Canton, O., has commenced the erection of an addition to their plant, 50 x 175 in dimensions. The new building will be used for the manufacture of galvanized iron.

The Fred W. Wolf Company has designed for

Hoffman Brothers a new brewery plant to be constructed at 1107 to 1115 West Monroe street, Chicago, Ill. The buildings will be of brick and stone, and will cost, exclusive of equipment, $16,000.

Before three months have passed the torpedo station plant, Newport, R. I., will have added something like $10,000 worth of new machinery to its already largely equipped machine shop for the manufacturing of small articles of naval ordnance.

The Automatic Electric Pump Company, of Boston, has purchased a lot of land on Shaw street, East Braintree, Mass., on the banks of the Monatiquit River, on which it proposes at once to build a factory. The company will give employment to 150 men.

The Pierce, Butler & Pierce Manufacturing Co., Syracuse, N. Y., are contemplating making an extensive addition to their business some time about January 1st, which will give employment to about 200 more men. Mr. W. K. Pierce is president of the company.

The Jones National Fence Company, Columbus, O., intends to increase its plant and add more machinery. The following are the officers of the company: President, C. E. Lewis; vice-president, Henry Hicks; secretary-treasurer, J. W. Frost; manager R. C. Kyle.

Bacon & Sibley, Spencer, Mass., are making extensive additions and repairs at their factory. A new brick boiler house is being built and an 80-foot chimney is to be erected. Alterations are to be made inside the shop to make room for their increasing business.

Material for a new 18 inch mill to be erected by the East Lebanon Iron Company, East Lebanon, Pa., is at the company's ground and work has been begun on the foundation. The building will be 160 x 60 feet, and will contain an engine, shears, etc., besides the 18-inch train.

Querns & Bros., 1916 North Fourth street, Philadelphia, Pa., are about to have built a boiler and engine house of fire proof construction, 24 x 42 feet, from plans drawn by J. F. Stuckert & Son, architects. It is the intention of the firm to put in new boilers, engines, dynamos, etc.

The E. Ingraham Company, Bristol, Conn., has decided to begin the manufacture of marine clocks. It will erect a new factory between the engine room and store house at the rear of and at right angles to the main building of the case department. The new structure will be two stories high.

After considerable negotiations with the ferry company, the Hoboken Land and Improvement Company, Hoboken, N. J., has decided to keep and operate the extensive machine and carpenter shops built on the river walk, near Tenth street, which have been in the course of construction for the past year.

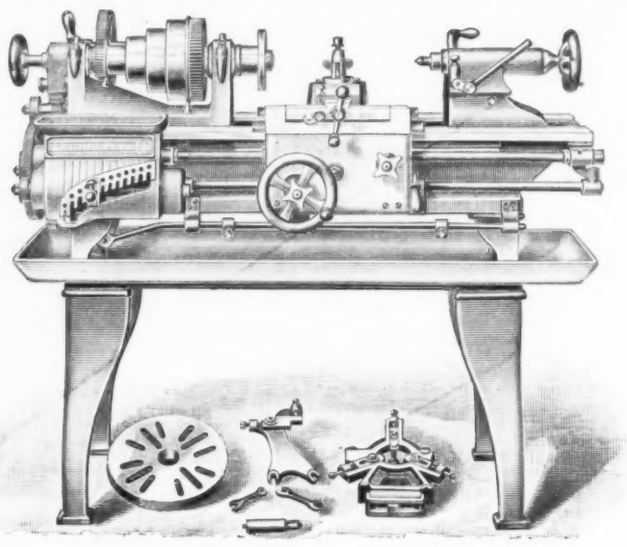
C. J. Meyer and W. S. Farrar, Carthage, N. Y., have formed a co-partnership and have purchased the mill sites between Hutchinson & Clark's flour mill and Eaton's sash and door factory on the West Side. They have begun the foundation for a brick mill 40 x 50, and in the spring they will erect another 40 x 65.

At Brunswick, Me., a new brick building, 44 x 100 feet, is to be erected. This building will be occupied by the Auburn Motor Co., and The Ferule Co., and it is expected that the Snow Signal Co., who are intending to branch out in the making of their machines on a larger scale, will also occupy part of the building.

The Jefferson Power Company, of Black River, Jefferson County, N. Y., to develop hydraulic and electric power and to manufacture lumber, wood pulp and paper, in the town of Wilma, Jefferson County; capital $125,000. Directors—William P. Herring and Frederick W. Herring, of Watertown, and James H. Hiland, of Chicago, Ill.

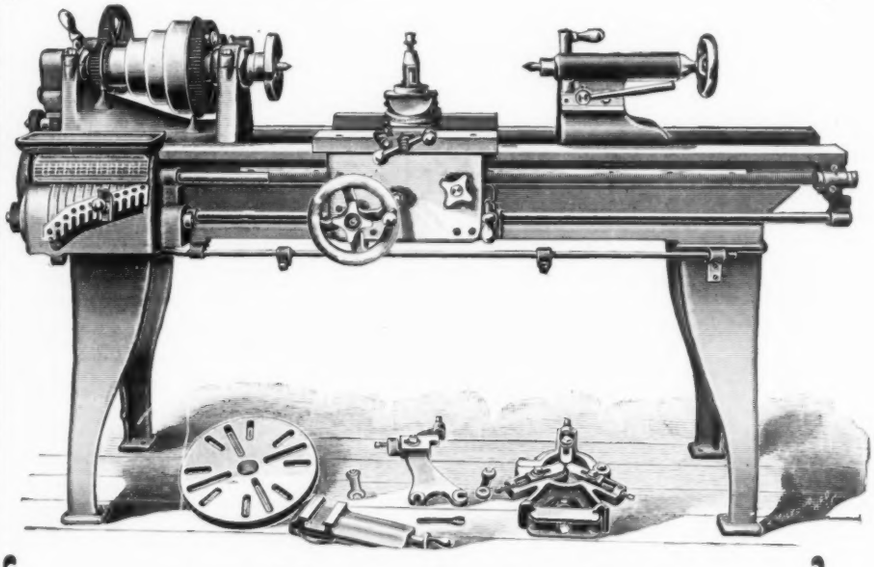
The Bennington Knitting Co., Bennington, Vt., has begun the work of enlarging its plant, which has been contemplated for some time. A large three-story storehouse is to be erected and it will be connected with the main building. A new office

(Continued on page 39)



12" Hendey-Norton Lathe

is fitted with drawing-in sleeve and American Watch Tool Co's standard chuck, used in making small taps, reamers, etc. Work finished first and cut from bar afterwards. No centering required. See carriage reverse lever by right-hand side of apron; no reaching for countershaft shipper required.



14" x 6' Hendey-Norton Lathe.

These lathes are modern, high-grade, practical tools, and are specially adapted for tool-room work. They have the Norton Attachment for screw cutting, giving 36 different threads and 36 different feeds with only two changes of gear and movement of lever in gear-box from one notch to the other. Note the automatic stop under apron. It will automatically stop carriage at any desired point in either direction; invaluable for internal or duplicate work. SEND FOR CATALOGUE.

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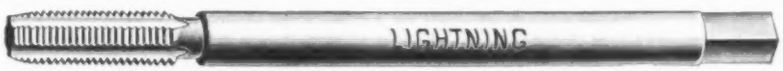
Chicago—42 and 44 S. Clinton st. *Boston*—281 Franklin st. *New York*—123 Liberty st.

FINE PULLEY TAPS, HIGHEST QUALITY.

"Lightning" and "Green River" Screw Plates, Taps and Reamers of all kinds.

Bolt Cutters, Drilling Machines, Punching Presses, etc. Send for Catalogue.



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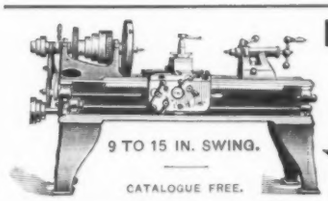

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PATENT SOLICITORS, 36 WALL ST., N.Y.

Have done all my patent soliciting work, both for this and foreign countries, continously for the past fourteen years.

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Foot Power Screw Cutting, Automatic Cross Feed, 9 and 12" Swing.

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1. Manufacturered of the best Steam Metal.
2. No regrinding, therefore not constantly wearing out the Seat of the Valves.
3. Contain JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids.
4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory.
6. ALL GENUINE stamped with Trade Mark.

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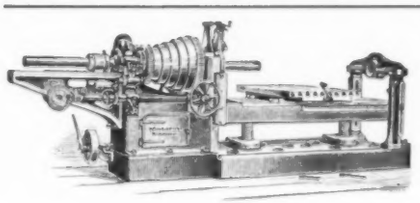

MACHINE TOOLS.

Distinctively Modern and Labor-Saving.

BETTS MACHINE CO.
Wilmington, - - Del., U. S. A.

(Continued from page 38)

is also to be built on the east end of the mill, and considerable new machinery will be put in.

The directors of the American Cement Company, whose three big mills are located at Egypt, Lehigh County, Pa., have decided to begin at once the erection of a new mill larger than any of the present ones. Its construction will involve an expenditure of $200,000, and the capacity of the mill will be from 800 to 1,000 barrels of cement a day.

C. T. Grantham, formerly manager of the Yarmouth Duck & Yarn Company, has been in Toronto, Ont., recently, in connection with the establishment of a cotton mill in Ontario. A company is being formed with $1,000,000 capital, and already $500,000 has been subscribed by Ottawa citizens. The mill, it is said, will be erected in Ottawa, Ont.

The Lancaster Machine & Knife Works, of Lancaster, N. Y., has been incorporated. The company is capitalized at $25,000, and the following are the directors: Andrew Cant, Roderick J. Cant and William C. Hodge, of Buffalo, N. Y.; John D. Blackwood, of Lancaster, N. Y., and William J. Cant, of Titusville, Pa. They are to manufacture edge tools.

The Ellwood Ivins Tube Company, whose mills cover several acres of ground at Oak Lane Station, Philadelphia, Pa., are making considerable addition to their already extensive plant in the way of more furnaces, machinery, etc. They have been running continuously all summer on orders. They report enormous contracts for '97' wheels, and it is on this account they are making additions to their plant.

The small sea-going steamer "Elsa" (33 tons), from Sandusky, O., has just made a successful trip around the lakes to the Marine Iron Works dock, Chicago, where that company will remove her present machinery and put in a Steeple compound condensing engine, a Worthington surface condenser with combined air and circulating pump, etc., and otherwise fit out the boat for her trip via the Mississippi River to Central America, for service on the Gulf of Mexico.

At Loveland, Col., a company, known as the Independence Smelting Company, was organized recently. The object of the company is to purchase and operate a portable smelter, which will be placed in the vicinity of Camp Carter for the purpose of testing the ores of the adjacent mining territory. The directors for the ensuing year are: George L. Clark, president; L. H. Skelly, secretary; J. N. Gordon, treasurer; D. H. Berger and C. S. Carter. The stock has been nearly all subscribed, and it is expected to have the plant in operation within 30 days.

The Glens Falls Paper Mills Company, of Glens Falls, N. Y., are making extensive improvements in their various plants and have placed the order with the Berlin Iron Bridge Company, of East Berlin, Conn., for a new pulp mill at Cadyville, N. Y., including water tower and boiler house. They have also placed an order with the Berlin Iron Bridge Company for additional buildings for their Kent's Falls plant, consisting of a pulp mill, boiler house, barker room and wood room. The contract is a large one. Orders for machinery for equipping the various buildings will be placed at once.

The Nicholson File Co., of Providence, R. I., report that the additions, repairs and extensions upon which they have been engaged throughout their four factories during the past few months, are nearing completion, and that they will soon be in a position to handle with ease the increasing volume of business. The constantly growing export business of this firm, together with the prospect of a considerably enlarged demand from the home trade upon the return of commercial activity and prosperity, necessitated some material changes about their works. Consequently, an increased force of designers and draftsmen have been engaged in designing and plotting improvements in both buildings and machinery; the capacity of the former has been increased by a more judicious distribution of some of the machinery; while the large new annealing house, completed but a few months previous, has been perfected. Other minor extensions have also been made. As for the machinery, a considerable number of new machines have been added to both the forging and cutting departments, while the product of the machines on hand has in many instances been doubled and in some even tripled by improvements. A new idea in rasp machines has been conceived and perfected that will enable a vastly increased number of more efficient rasps to be turned out daily. Altogether, the dull season during the past few months has proved valuable, they state, in enabling them to prepare more completely for the future.

SMOOTHBORE.

SMOOTHBORE HANGERS

Have self-oiling boxes. The oil chamber is of generous proportions and will hold oil enough for from three to six months. Suitable for high speed light or heavy work. The boxes are of ample length in proportion to diameter of shaft.

SMOOTHBORE HANGERS.

The boxes are lined with a very good grade of Babbitt metal. They are reamed on a special machine, which leaves them very smooth and polished—equal to a Gun-barrel Finish. They fit the shaft all over.

SMOOTHBORE HANGERS.

We use a long wick made of best grade of Felt—have never seen a longer wick in a hanger. An experience of many years has shown us that this wick system is simple, positive and reliable, and it has met every requirement thus far.

SMOOTHBORE HANGERS.

Correct proportions. The spread of the base is properly proportioned to the drop or length of the Hanger. The metal is well disposed throughout so as to secure the greatest possible strength without excessive weight.

SMOOTHBORE HANGERS

Are adjustable in all directions. They are easily put up. They are finished perfectly true on the base.

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Are made for the ceiling, floor, the wall or post; all styles for all purposes.

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Are carried in stock, and can be shipped on receipt of order. We are sending them to all parts of this country and to Europe. Conducting this department on a large scale, we are able to make very low prices.

SMOOTHBORE HANGERS

Are described and priced in our booklet, which contains a number and a Code name for all sizes to facilitate telegraph orders.

SMOOTHBORE HANGERS.

Let us send you one by Express or Freight so that you can see for yourself what they look like.

SMOOTHBORE HANGERS.

People like to have all their overhead work uniform in design. How queer it looks to see one style of hangers used on the line shafting, and half a dozen or more different styles used on the countershafts. Our hangers are, we may say, the *fashion*, and if you send them out with your countershafts, your customers will be well pleased.

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Both Hand and Power. Sizes 1 to 6 in.

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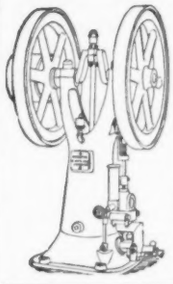

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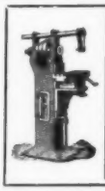

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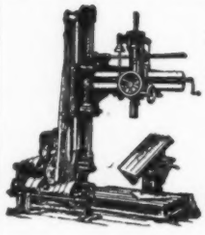

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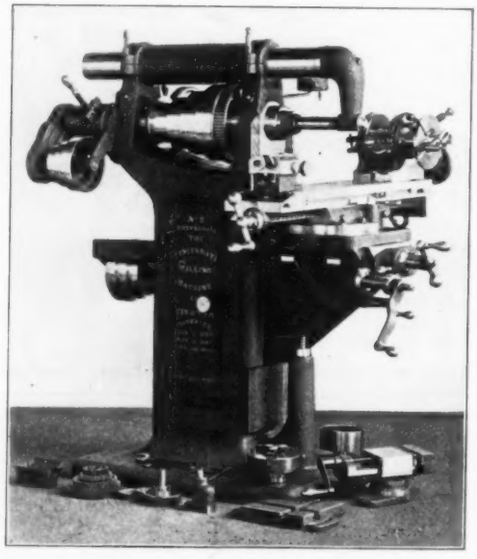

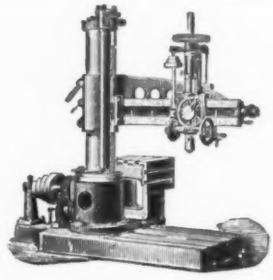

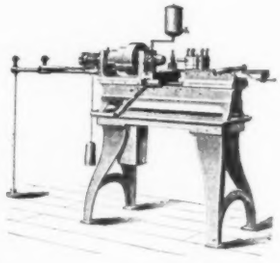

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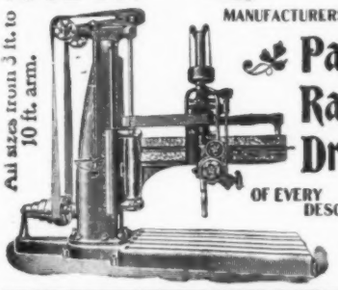

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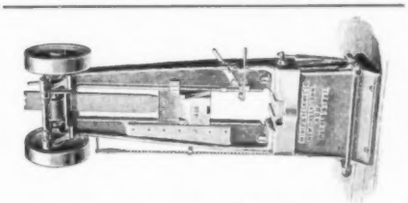

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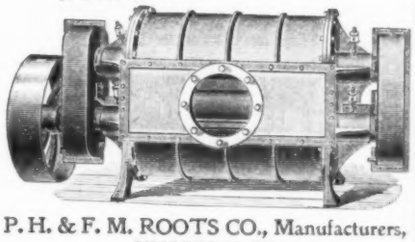

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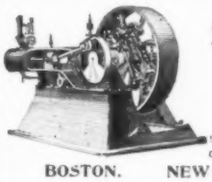

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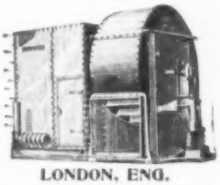

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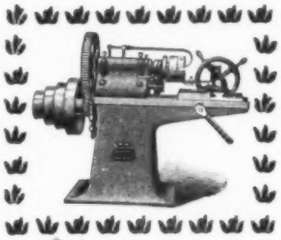

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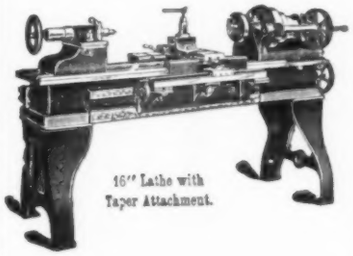

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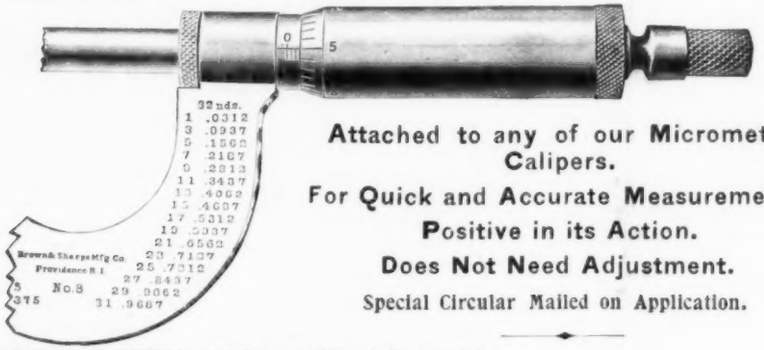

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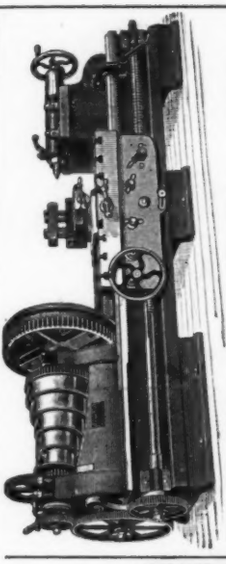

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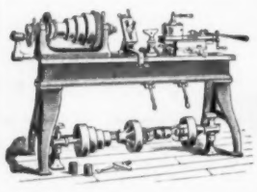

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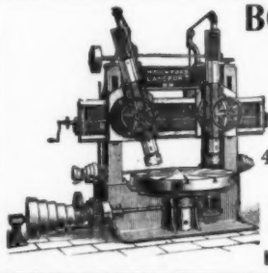

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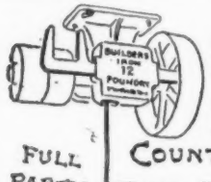

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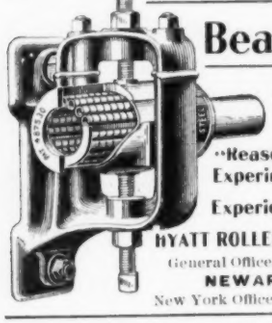

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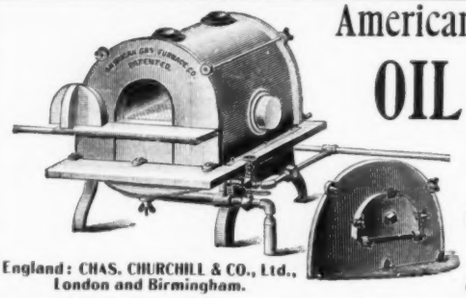

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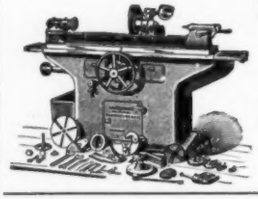

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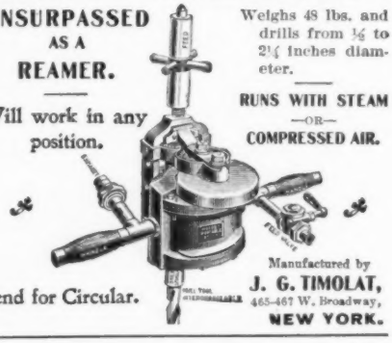

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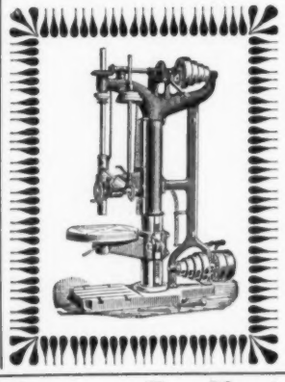

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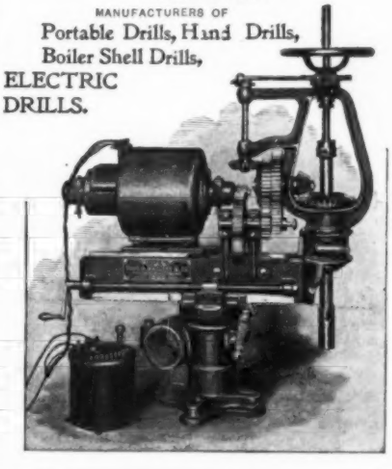

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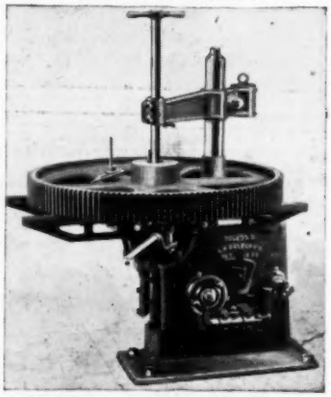
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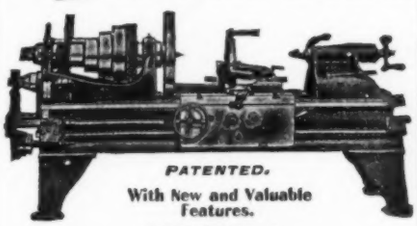

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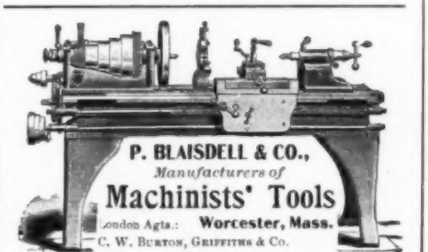

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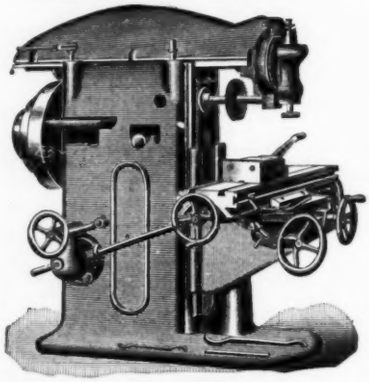

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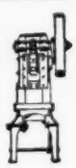

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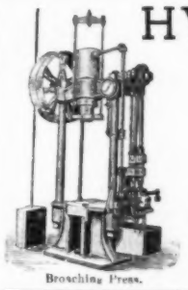
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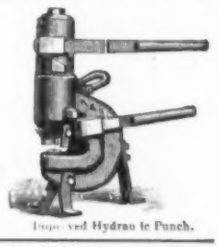
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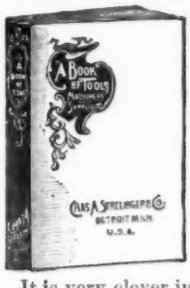

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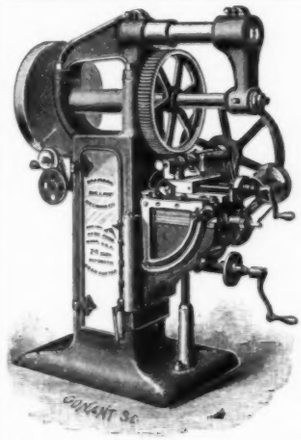

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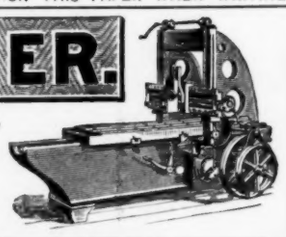

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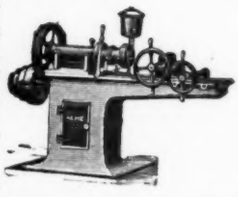

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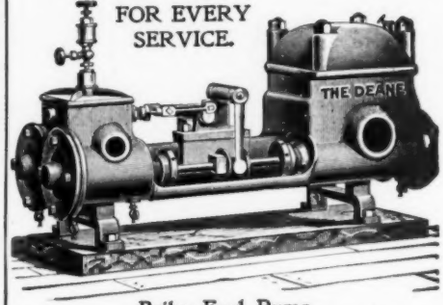

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their heads." So they were everywhere and nowhere, and mainly "cluttered" up the machine shop, and it was usually easier and cheaper to order a new casting from the foundry than to find one ready made among the lathes and drill presses, or the partially completed machines, on the erecting floor.

A glance at Fig. 1 will show that castings delivered at this shop not only have a place where they can rightfully lay their heads, but that each individual casting has a certain specified and designated locality assigned to it. If it is a large casting, a certain floor space is reserved for it, and this space is designated by symbols painted on little sign-boards attached to the upper floor timbers, and high enough so that all of them can be seen and read from any position in the room. Under these guide-boards will be found on the floor the heavier castings for the machine indicated, and in the contiguous wall bins the smaller castings for the same machine.

The door at the right leads into the office, and the only irregularity to be seen in the picture results apparently from the fact that the photo was taken at a season of the year when the office stove was not in use and was therefore classed as a casting The larger door back of the man is where the castings come in. The trucks, when driven up to this door, are level with the

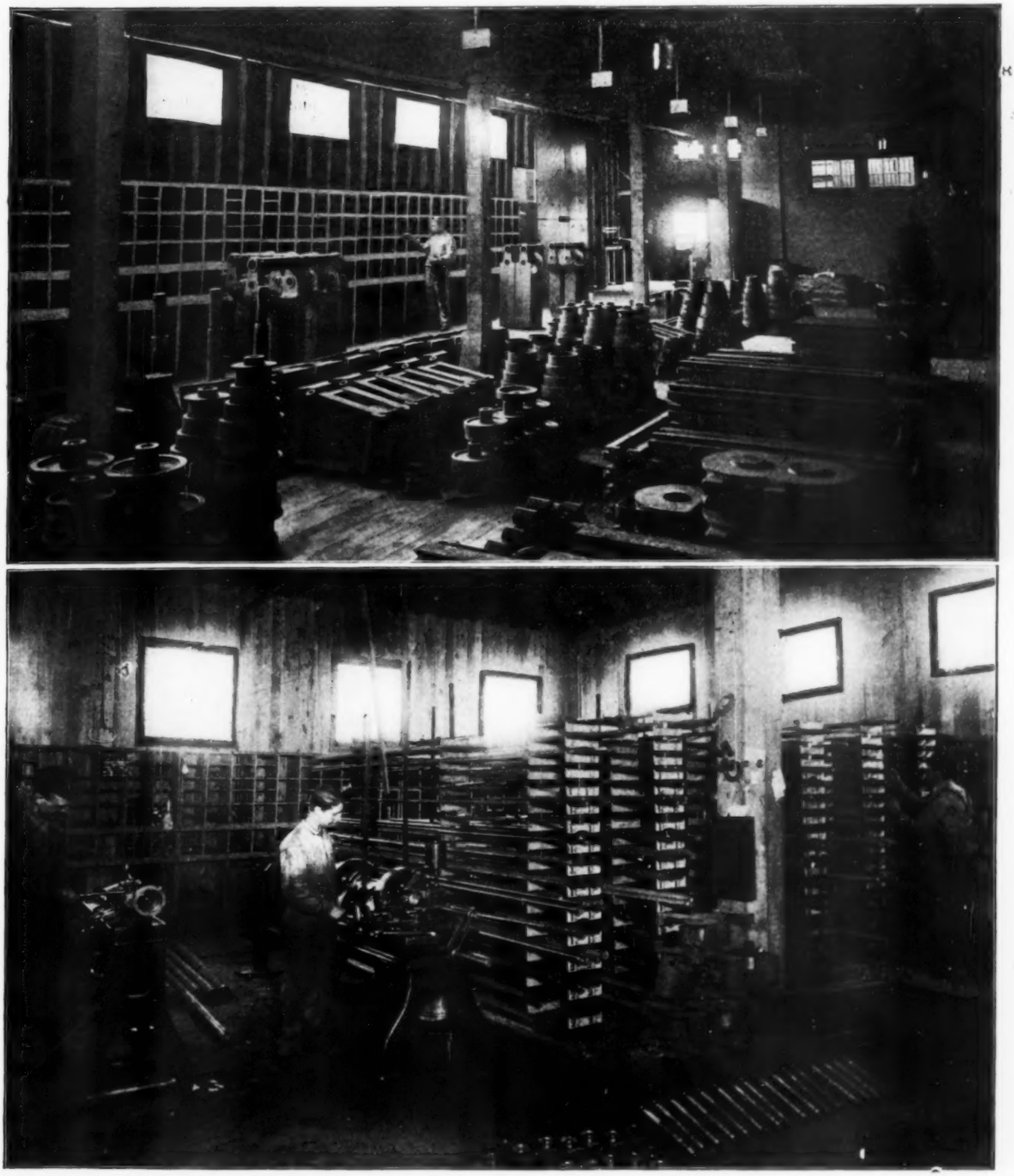


Fig. 1. CASTING STORAGE. Fig. 2. STEEL BAR STORAGE.

casting-storage floor, and an overhead traveler takes the castings and delivers them at any section. The beam of the platform scale by which they are weighed is seen at the right of the door..

When castings are received here, there is no doubt about where they should go, no moving of others to make room for them, and no piling of four tons of castings that won't be needed for a month on top of one that will be needed to-morrow. When a machinist wants one of them, the man who goes for it knows exactly where it will be found, and he can get it without the least difficulty.

STORAGE OF WROUGHT STOCK.

The arrangements for storing bar steel and wrought stock generally are equally systematic, and the room devoted to this is shown at Fig. 2. Standards are fastened to the floor, and to these are fastened, by set-screws, the short supporting arms with upturned ends upon which the bars of stock are laid. Figures designating sizes are painted on these arms, as shown; sizes progress in regular order, and every bar in stock can be readily come at, and its length measured, without removal from the stand. The six stands seen on the floor hold two carloads of stock.

In the bins ranged around the outside of the room are the smaller wrought parts of machines, and in the foreground are the cutting-off and centering machines.

PLANER PRACTICE.

A corner of the machine shop on this same floor is shown at Fig. 3. This corner is devoted to planers. They all rest upon stone foundations independent of the floor, and here are found a number of special fixtures designed to facilitate the work, secure accuracy and economize the labor of both planing and scraping. The work on the planer in the foreground speaks eloquently of the difference in cost between machines built in large numbers and those built one at a time, and the second one shows, in use, a special angle-plate which is carefully scraped square and true to represent the front of the column of the machine. The knees are planed to fit this angle-plate and it is then used to hold the knee on the planer platen while that portion to which the saddle is fitted is planed. Thus, it would be rather more difficult and bothersome for a planer man to get the knees "out of square" than to get them right. In this case a string of pieces all planed at once is not possible for obvious reasons.

FINISHED PART STOCK ROOM.

At Fig. 4 is the stock room for finished parts of machines. At the left, in the cupboards and in assigned places upon the floor, the stock is kept from which the erectors draw their supplies. With each lot of parts there is one piece which is the sample or model by which the others are made. Its various sizes and such other information as is needed are stamped upon it, and it serves the lathesmen and others in lieu of shop drawings or blueprints.

So long as there is an ample supply of finished pieces, this sample is kept with them; but when the stock of any part gets low and it is time to think about making some more of them, the sample is taken out of the bin and put in its appropriate place on the table, seen at the right. This table is divided by partition strips to facilitate classification, and when any given sample is found there it means that as soon as things can be brought around to it some foreman machinist should receive that sample with an order to make a lot of pieces like it.

The condition of the table at the time of my visit, and when the photo was taken, indicates that there is no immediate danger of the shop being run on short time for lack of work.

This arrangement serves to show at a glance what parts are low, and avoids a good deal of unnecessary delay in making shipments for the lack of some part small enough to be overlooked, yet just as necessary as the elevating screw or the cone pulley.

Just outside this stock room, and convenient to it, is the erecting floor, shown in Fig. 5, and at Fig. 6, a corner in which are vise benches and some of the fitting stands which have been previously mentioned, and which seem to afford remarkable facilities for getting at the surface to be scraped in the best possible manner.

SURFACE SCRAPING.

Speaking of scraping, their practice here reminds me that I have long thought it ought to be time for machinists to get over the idea that they can fool each other about the character of a scraped surface and what it represents.

A good many machines go into the hands of men who know little or nothing about scraping, and readily believe that the more ornate the pattern of scraping, the better the artist who did it, and the better the job of scraping must be. But we machinists know better than that, Mr. Editor. We know that a man can take a good sharp scraper, smear a little lard oil over the surface to be scraped, and by skillful manipulation produce a surface that is merely beautiful to look upon; or, rather, it is if the looker don't happen to know that it is simply a fraud, and that the man who did the work had no more conception of what a scraped surface should be than a man has who makes washboards for a living.

It has seemed to me that since machinists generally are "onto" this that we might as well give up the practice of ornamenting scraped surfaces on machines that are to go into the hands of machinists, and follow the example of a few leading builders in leaving these surfaces as they naturally appear after being scraped, with the sole object of making them true and smooth. It may be all right for us to fool the Philistines that buy general machinery, but when we attempt to fool tool-buyers we only fool ourselves, is seems to me.

There is another side to this matter, however, and, wishing to be fair, I will present that also, and the strongest presentation of the other side that I know of is simply to tell what the practice of the Cincinnati Milling Machine Company is, and the philosophy upon which it is based.

To begin with, we must acknowledge that an irregularly scraped or an unadorned scraped surface may be just as much of a fraud, so far as accuracy is concerned, as any other, simply because the work may not be skillfully or conscientiously done.

Fig. 7 gives some idea of how the scraped surfaces on the front of the column of a Cincinnati milling machine look. I asked Mr. Geyer to have it photographed for me, and in the kindness of his heart he has done so, evidently rather against his inclination, being reluctant to have the photograph presented to readers of the "American Machinist" on the ground that it will be misleading, and he says: "It gives the appearance as if the surface was dug out; whereas the purpose of our style of scraping, as you well know, is to get a perfectly smooth surface."

The fact is, however, that the photograph faithfully reproduces the appearance of the scraped surface as it looked to me. The surface is one of those which you instinctively rub the tips of your fingers over to see if it really is composed of a lot of little hills with valleys between them about a quarter of an inch deep, or only appears so. As a matter of fact, it only appears so, and is produced by what to me is a new method of handling the scraper. The scraper is a straight, plain affair, such as is commonly used, but particular pains are taken to have its broad edges precisely straight and very keen. The surface is first carefully scraped true and to a good bearing in the ordinary manner, and I saw this work being done and know that it was well done.

After this the broad scraper was applied and passed over the surface with a motion somewhat suggestive of a boy walking on stilts, only that in going across the surface no part of the scraper's edge was at any time removed from the metal. The scraper being applied in the usual manner, was first swung around in an arc of a circle, one extreme end, or corner, of the edge forming the center upon which it turned; then the corner which had been thus advanced became in its turn the center about which the edge was swung to advance the other corner; and thus, swinging alternately, first on one corner

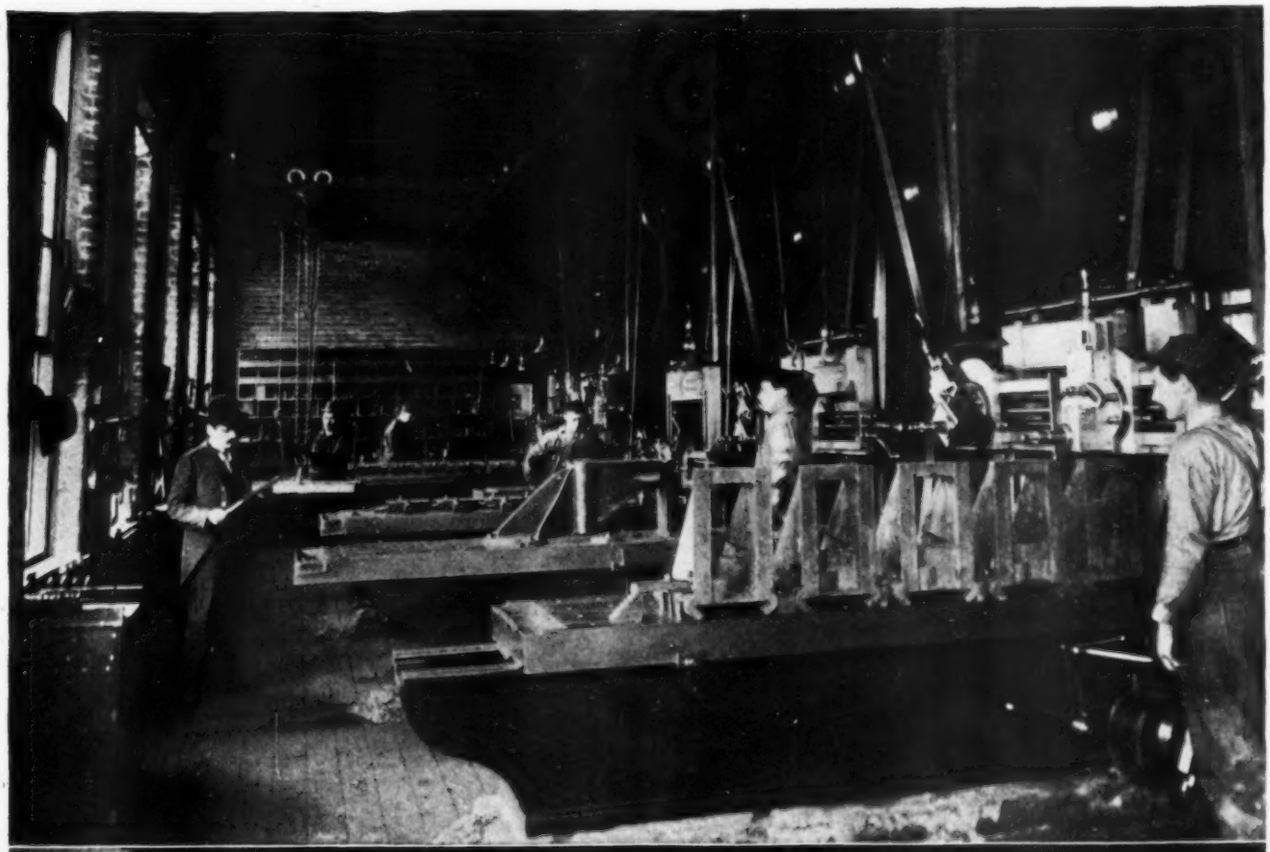


Fig. 3. A GROUP OF PLANERS. Fig. 4. STOCK ROOM FOR FINISHED PARTS.

Fig. 5. ERECTING FLOOR. Fig. 6. VISE BENCHES AND SCRAPING STANDS.

and then on the other, the scraper was advanced across the surface, taking an exceedingly light cut, yet sufficient to remove the exceedingly small and fine high spots left by the previous orthodox scraping operation, and making the surface marvelously smooth without destroying its accuracy in the least. Mr. Holtz, who gave me an opportunity for satisfying myself on this point, stated as his belief that this final scraping in that manner with a broad scraper did not in the least impair the accurate truth of the surface secured

Fig. 7. A SCRAPED SURFACE.

by the previous scraping, and, by removing the small high spots, gave a better bearing surface—a surface better adapted to its purpose than it would otherwise be.

This, however, is ornamental scraping for an entirely different purpose from that which inspires the scraping first referred to, and I don't just see how we are to distinguish between the two kinds, or, in fact, to know much about the character of a scraped surface, unless we see the work done, or test it, or pin our faith to the name-plate. And it is safe to do this last sometimes. What we call "a name" usually has some reason for its existence, and represents careful, conscientious and skillful work in the hands of satisfied customers.

I have recently seen scraping composed of regular squares, each with a Maltese cross in the center. No name-plate could, I think, ever make such scraping look like the genuine article, or look right to a genuine machinist.

S. T. FREELAND.

"Limit" Taps.

If a tap is made straight or truly cylindrical, it must lose its size by becoming smaller from end to end the first time it is put through a piece of metal; not very much smaller, for we know that a straight tap will tap a large number of holes before the threads thus produced become materially under size. But we also know that sometime in the continued use of a straight tap the work it produces will begin to be noticeably undersize, because the tap itself has worn down to a smaller diameter than it originally had, and as this reduction of diameter comes from work, we know it must begin as soon as the work begins, and that, in point of absolute fact, the straight tap must lose its original size in the work of tapping its first hole. With the truly cylindrical form of tap, by far the greater part of its work is done at the leading end, and in consequence it follows, of necessity, that a tap which is originally truly cylindrical must become a taper tap as soon as it has done a certain amount of work, and by the same course of reasoning it is clear that the originally cylindrical tap must become a taper tap as soon as it passes through its first piece of work. All of these conditions and results are perfectly understood by those who have made a study of the matter, and by those who have had an extended experience in attempting to produce tapped holes of uniform diameter in which carefully sized screws will turn with an approximation to uniformity of fit and friction. I do not know of any such thing as the tapping of threaded holes to absolutely uniform size, and do not believe that there can be found in any manufactory screws so nearly to one size, or holes tapped of so nearly a uniform diameter that some screws will not be found much better fits in some holes than others, judged by the hand on the screwdriver, and I am certain that in the case of cycle spoke nipples the work sold by the largest makers is very far from being of uniform thread diameter. I do not believe that internal threads of uniform diameter can ever be produced with a single tap, nor that uniform diameter tapping can ever be done with taps of an originally cylindrical form. I do believe, however, that with taps of the "limit" form, which I shall presently describe, and which is not new, but, on the contrary, very old, although not commonly found in taps offered for sale in the open market, tapped holes may be produced which shall vary in diameter only within fixed limits, and what is more, that this variation limit may be made as small as is desired; which amounts to saying that by the use of the "limit" form of tap, tapped holes may be produced which are substantially of uniform diameter. Before dealing with the "limit" form of tap, it is worth while, for the sake of a full understanding of the action of a tap, to consider the action of a taper tap in work. As each turn of thread of such a tap is smaller in diameter than the one which follows it, it is obvious that the whole outline of each and every cutting tooth of the tap must remove metal from the nut being tapped as the work of tapping this nut proceeds.

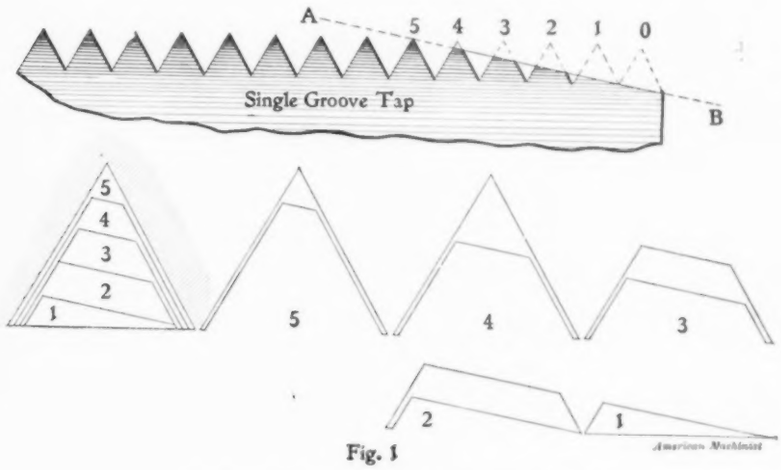


Fig. 1

ILLUSTRATING ACTION OF TAPER TAPS.

In Fig. 1, let the top figure represent the cutting teeth in the one single groove of the tap; there are commonly four grooves in a tap, but for simplicity of illustration, suppose this tap to have but one groove, and hence but five cutting teeth in the nose of the tap, which is sloped in a straight line and backed off on the slope line *A B* in the usual manner. Then, because this tap is taper, every part of the outline of tooth 2 is farther away from the axis of the tap than tooth 1, and every part of the outline of tooth 3 is farther away from the axis of the tap than that of tooth 2, and so on, tooth 5 being farthest out of all; hence, the angular sides as well as the tops of the teeth must always be in cut when the tap is at work. Consequently, the successive chips cut by teeth 1, 2, 3, 4 and 5 as the tap ad-

vances into the metal must have the forms shown at 1, 2, 3, 4 and 5 in Fig. 1, these chips originally occupying positions in the nut as shown in 6. It is clear from this pictorial representation that chip 1 requires the least power to cut it, and that the power required to cut each chip increases regularly up to the fifth, which has about three times the length of cut of the first, and hence may be supposed to require about three times the power. It is this shape which causes the supposedly cylindrical tap, which is really a taper tap, to consume very much more power than is required by a "limit" tap to do the same work, because the taper tap cannot simply deepen a partly cut thread groove by removing metal from the bottom of the cut only, but must also widen the cut as it deepens it.

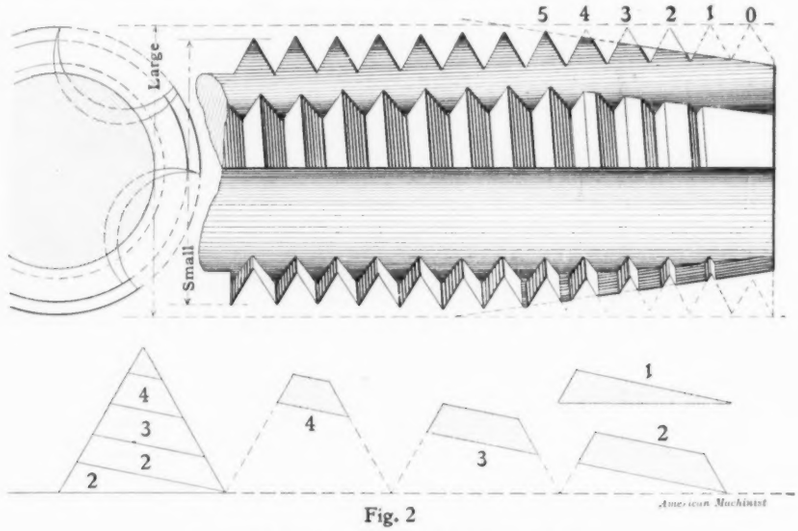


Fig. 2

ILLUSTRATING ACTION OF "LIMIT" TAP.

Because of all the foregoing, I shall assume it as proved that no truly cylindrical taps can be used, because taps originally truly cylindrical become taper taps as soon as they are put at work, and that taps originally cylindrical in form cut over the entire surface of each tooth in the whole length of the taps if passed all the way through a nut. I do not need to "assume" it proved that the originally cylindrical tap loses its size the whole length the first time it passes through a piece of metal, because that fact is conclusively shown by everyday experience. From what I am about to show in regard to "limit" taps, it will be seen that in no case should a tap ever be made originally truly cylindrical, or of one diameter throughout its entire length, although almost all of the taps offered for sale are so made, in obedience to a blind following of traditions and a failure to consider the actual conditions of tap use.

The "limit" tap is of the shape shown in Fig. 2, largest at the nose or entering end, and a straight taper from one end to the other. The nominal diameter should, perhaps, be located at the middle of the length of the thread, and the taper should be, perhaps also, considerable; say on a ½-inch tap of ordinary length of thread as much, I think, as 0.005 inch, or half a hundredth of an inch. I am not at all certain as to what should be the exact difference in the diameters of the two ends of a ½-inch tap, because in my own experience I have never used any taps of this shape in which any attention was paid to securing accurate sizes in parts of an inch, except in cases where the diameter was very much greater that ½ inch and the taps were made of adjustable diameter; my experience with small taps of the "limit" shape has been confined to cases where only a few thousand holes were to be tapped of nearly uniform diameter, and I cannot therefore be sure from my own experience as to the proper taper per inch for taps of this kind. But assuming the threaded part of a ½-inch tap to be 2 inches long and the taper 0.005 inch, and the threaded part of the tap to be ½ inch diameter at its middle point and the nose of the tap to be chamfered off for a distance of ½ inch to form the cutting part, then the first holes tapped by the "limit" tap will be one quarter of 0.005 inch or 0.00125 inch too large, and supposing the tap to be worn entirely out, that is to say, ground away as the nose grows dull until the last thread made the size, the last hole tapped would be one-half of 0.005 inch or 0.0025 inch below size, and the maximum diameter variation in the work done in the lifetime of the tap would be three-quarters of 0.005 inch, or 0.00375 inch.

It will be observed that with this form of tap the extreme possible variation in work diameter produced can be foretold from the first; while with a tap originally cylindrical, nothing of the sort can be predicted. It is only known that the originally cylindrical tap will become a taper tap, and that it will constantly diminish in diameter from end to end as it is used. It is also certain that the shape of thread produced by the "limit" tap will always be that given to the tap threads, while the shape of thread produced by an originally cylindrical tap is always uncertain. The "limit" tap always finishes the outer point of the nut thread with a new and unworn cutter, while the points of all the teeth of an originally cylindrical tap are dulled in some degree by its first passage through a piece of work.

The tap-makers are perfectly aware of the importance of using cutters to thread taps which employ the "limit" idea. The threading tools used in automatic tap-making lathes are not single-point tools, but chasers, set so that the leading end of the chaser is nearest the axis of the taps to be threaded; the consequence is that so long as the line of chaser teeth maintains its original obliquity to the tap axis, and is not moved in or out, it may be ground in position as its leading end becomes dulled, until worn out, without causing a greater diameter variation in the taps produced than twice the opening of the angle between the following end of the chaser and a cylinder placed in the lathe centers. The angle of obliquity used in setting the chasers in automatic tap-cutting machines is very small, perhaps giving only one or two thousandths opening of the angle at the following end of the chaser, which would give 0.002 inch or 0.004 inch as the extreme variation in tap diameter produced in the life of the chaser.

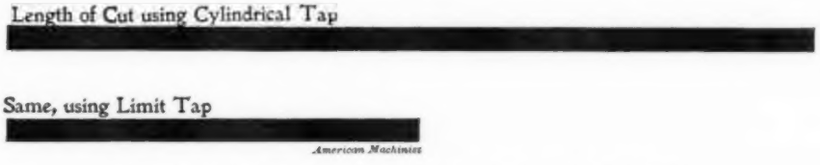
I do not know why chasers are not always used in the tool-post of the engine lathe for threading screws; I know the practice of using single-pointed threading tools in the engine lathe is almost universal, even in shops where the use of the chaser in threading taps is invariable.

The "limit" idea is also used in setting broad-nosed scraping tools in planer work; the leading corner of the scraper is set low, with the result that the difference in the hight of the first and last cut made during the life of the scraper can not exceed the difference in the hight of the leading and following corners of the tool. Lastly, "limit"-shaped taps are regularly made in some tool-rooms for shop use, and some large contractors in New England shops make "limit"-shaped taps at their own expense rather than use cylindrical taps furnished by the shop free of cost, because the "limit" taps turn easier in tapping, do not break off, and tap holds more nearly to size.

The successive cuts taken by a single-grooved "limit" tap, and the shapes of the successive chips produced, are shown in Fig. 2, and Fig. 3 shows graphically the comparative length of chip surface cut over by the cylindrical tap and the "limit" tap to produce the same thread by the removal of the same number of cuts; and it seems likely that the power required is even much less than this lesser length of chip cut in case of the "limit" tap would

seem to imply, because the teeth of the taper or originally cylindrical tap are always in hard contact with the whole interior of the nut covered by the tap, while the "limit" tap is free from the surface of the nut, except at the points of actual cutting action. From my own experience I should say that the "limit" tap requires only about one-fourth the power to turn it which is demanded by the taper tap doing the same work.

Francis H. Richards, of Hartford, is a sufficiently ingenious tool-maker to have found a way to make taper taps for tapping pipe fittings so that his taper tap was always biggest at the little end, impossible as this statement seems, and this Richards "limit" tap worked with surprising ease.



COMPARATIVE LENGTHS OF CUT FOR SAME EFFECT.

Suppose three "limit" taps, all new and all the same diameter and same shape, are successively put through a piece of metal, the second and third taps would merely touch the threads formed by the passage of the first through the hole. Supposing this operation to be repeated a great number of times; the first tap does almost all the work and grows smaller as it is sharpened, and the second tap will at some stage of the repeated operations begin to take a small cut, while the third tap will for a long time pass through the work inoperatively, but may during the life of the first tap begin to take a small cut, and the variation of the diameter of the work made can be accurately determined by noting the length of the third tap which is in cut, or in contact with the metal, because the taps all have uniform end diameters and are of uniform taper, and hence are of known diameter at any point in the length of any one of them. As soon as the third tap shows that it is cutting the minimum diameter the first tap is discarded, No. 2 becoming No. 1, No. 3 becoming No. 2 and a new tap being supplied for third place, and the work proceeds as before, except that the No. 2 tap is slightly smaller than in the first stage, when all three taps were new, and consequently the new No. 3 would have a little work to do from the first. But I believe that this diminishing tap diameter would not affect the possibility of accurate sizing by this 3-tap method, because the No. 1 tap has such a great proportion of all the work to do that the change would probably come from the wearing out of the No. 1 tap rather than from the falling of No. 3 below the minimum diameter. At all events, the threaded part of the taps could be made of such length that No. 1 would be worn out before the diameter of No. 3 was so much decreased as to be noticeable.

To carry out this 3-tap operation without loss of time, a vertical turret work-holding fixture, mounted on a horizontal shaft and having a step rotation from one work seat to the next, may be employed; this turret to be confronted by three tap carrying spindles of ordinary construction, spaced the same as the work-holding seats, so that all three of the taps can operate simultaneously, and thus tap work by the 3-tap method in the time required with a single tap by ordinary methods.

There is nothing new under the sun, and perhaps some of the readers of this paper will be able to tell me where I can see this method of tapping with three or more exactly similar taps in operation. It is new to me, however, and the variation in cycle nipple thread diameters put on the market by the largest manufacturers of those articles, convinces me that there are good establishments in which this method of tapping is unknown.

The only method known to me as in common practice for keeping tapped holes to size, is to make all the taps of one diameter by finishing with an adjustable sizing tool, so that the taps are cylindrical and of uniform size, and using these taps in pairs, one for roughing and one for finishing; and as soon as the holes come small the roughing tap is thrown away, and the finishing tap is taken for roughing and a new tap for the finishing cut. Deep blind holes tapped by this method are always small at the inside end.

HORACE L. ARNOLD.

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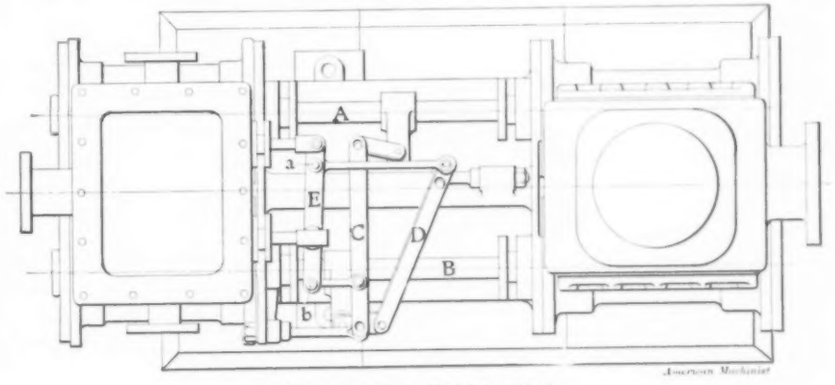
The average age of students entering the Mechanical Engineering Department of Cornell University is now twenty years.

Duplex Pump Valve Gear.

We present herewith from the columns of "Engineering," a diagram showing in plan what appears to be a real improvement on the standard construction of duplex pumps.

It is well known that the pause of each piston at the end of the stroke takes place in the standard form of pump with the steam port full open, which results in the cylinder being packed full of steam, even though the work of the stroke may have been made with the steam considerably throttled. The main purpose of this gear, as we gather it from the description, is to overcome this difficulty by causing each piston to move its own valve enough to close the admission, open the exhaust and give a slight lead, but no more—the opening of the steam port to full steam for the return stroke being accomplished as at present by the opposite piston.

The mechanism is extremely ingenious, as will be seen from the illustration, although at the same time it is quite simple. The usual swinging levers do not connect directly to the opposite valve stems, but to the floating lever *E*. In the position shown, piston rod *B* is at rest, and pin *a* is consequently a fixed fulcrum. The movement of lever *E*, derived from *C*, consequently moves both valves—that of side *A* sufficiently to cut off steam, open the exhaust and give lead; and that of side *B* to give full steam. *A* hence stops at the end of its stroke, when pin *b* becomes a fixed fulcrum, and the next movement of the lever *E*, derived from *D*, acts to exhaust the steam from the *B* side and to open the valve of the *A* side to full steam.



DUPLEX PUMP VALVE GEAR.

The action of the gear is also claimed to give a full and defined stroke to the pistons, and to shorten the length of the pause, thereby giving a larger number of strokes for a given actual piston speed.

The pump is being introduced to the English market by Beaver & Dorling, of Dewsbury.

▲ ▲ ▲

To a Paterson machinist belongs the distinction of offering to make the oddest bet on the Election we have heard of. He offered to put up his life's services as a machinist on his candidate against $1,000.

ELECTRICAL MACHINERY.

Electrical Devices for Changing the Speed of Series Motors—II.

BY WM. BAXTER, JR.

In a previous article under the above heading, it was shown that the velocity of a motor could be increased by arranging the field coils so that the whole or a portion could be placed in service. This method renders it possible to increase the speed, but not to decrease it; that is, if the motor is regarded to be in its complete form when all the wire on the field is traversed by the current, its velocity then will be the lowest, and the successive cutting-out of portions of the coils will increase the speed. Changing the magnetic strength of the field is the only way in which any variation of the velocity of a series-wound motor can be effected; but the arrangement of dividing the field coils up into sections, and cutting these out in succession, is not the best that can be used, and it does not admit of as great a change in the velocities as that known as the commutated field method, which is generally regarded as superior. This method is shown in the accompanying diagrams.

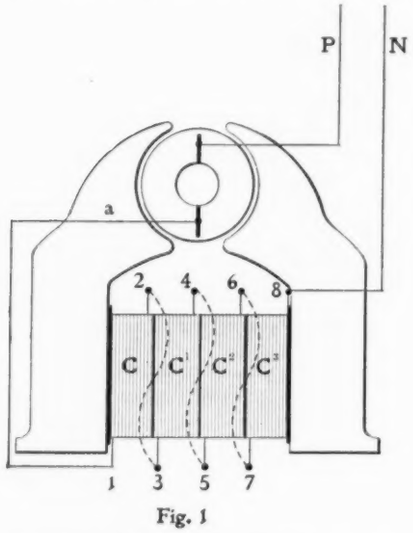


Fig. 1

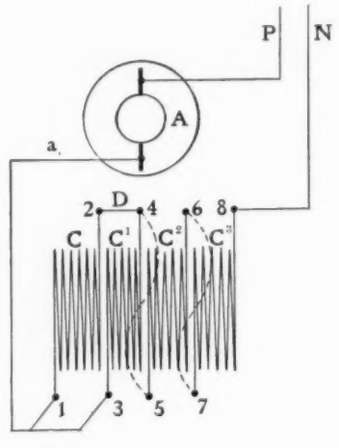


Fig. 2

Fig. 1 shows a motor with the field wound for this arrangement. The design here used is one in which the field is magnetized by a single coil, this construction being considered more advantageous to show the wire connections, on account of its removing the complications that would have to be introduced to show the connections of a motor provided with two coils; but the system can be applied to any number of coils.

The field coil in Fig. 1 is divided into four sections, C, C^1, C^2, C^3, and the end of the first section is connected with the beginning of the second, as shown by the dotted line running from terminal 2 to terminal 3. In the same way, the ends of the other sections are joined; hence, if the current enters through the wire P it will pass through the armature and then through all the sections of the field in succession, or in series, as it is generally expressed. The object of the commutated field method is to so connect these sections that they may be placed in parallel with each other as well as in series. The changes or combinations that can be made with the division of the field coils into four sections are shown in Figs. 2, 3, 4. In Fig. 2, it will be noticed that the wire a, coming from the armature, connects with terminals 1 and 3, and also, N by the wires D and E. The terminals 2 and 3 are connected with each other, as shown by the dotted line, and so are the terminals 6 and 7. By tracing out these connections it will be seen that the current passes through the field in two circuits, one by the way of wire b and sections C, C^1 to wire D, and the other by wire c and sections C^2, C^3 to wire E.

In Fig. 4 it will be seen that the current from the armature passes by wire a to all the lower terminals of the four field sections, and from all the upper terminals it goes direct to wire N. In this case, therefore, the current passes through the field coil by four paths, each one consisting of a single section.

A study of these four figures will show that in effect this arrangement is the same as the one shown in the previous article on this subject. That is, in the first figure the current passes through all the sections of the field. In the second it only passes through three in effect, because the two sections C and C^1 are in parallel, and the two together only have the effect of one, owing to the fact that each one is traversed by one-half the current. In the third figure the effect is the same as it would be if only two sections were in use, for here there are only two in series, and the fact of there being two in parallel only serves to provide two paths for the current and to divide the latter into two equal parts, but the action upon

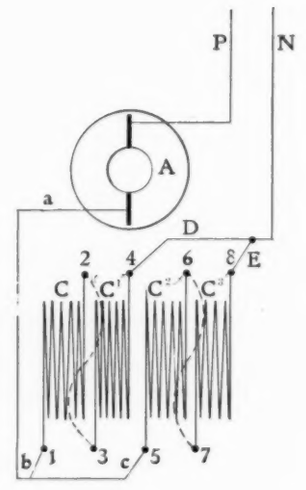


Fig. 3

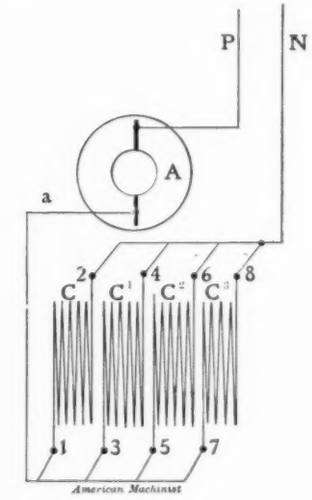


Fig. 4

COMMUTATED FIELD FOR SERIES MOTOR.

that the other ends of the coils to which these terminals belong, that is 2 and 4, are connected with each other. Under this arrangement, the current will pass through the two sections C and C^1 in parallel, and through the other two, C^2 and C^3, in series.

In Fig. 3 the wire a connects with terminals 1 and 5, by the wires b and c, and terminals 4 and 8 are connected with wire the field is the same as it would be if only one of the paths were used. In the fourth figure the current only passes through one section in series, and through the four in parallel; this simply divides the current into four parts, but the effect on the field is just the same as it would be if all the current passed through one of the sections and the other three were cut out.

From the foregoing it will be seen that

in so far as the electrical action is concerned, this arrangement is precisely the same as that of cutting out in succession the various sections of the field coils; but it is superior to it, for the reason that it renders a greater variation in velocity possible. In Fig. 1 all the current that passes through the armature traverses the whole of the field coil sections, but in Fig. 2 it passes through two and then divides between the other two. In Fig. 3 it goes through the field by two paths, and therefore only one-half the current flows in each; and in Fig. 4 there are four paths, and each one carries one-quarter of the current. As the heating effect of the current is proportional to the square of its strength, it follows that in Fig. 3 the heat generated in the field coils will be one-half as much as it would be if two of the sections were cut out and all the current passed through the other two; and in Fig. 4 the heat generated is one-quarter as much as it would be if only one section were used and the other three were not. As the amount of current that the field can carry with this arrangement is very much greater than in the one described in the article already referred to, it is possible to run the motor at a somewhat lower speed with the field commutated than when all is in service, providing the armature wire is large enough, by simply allowing the current to increase sufficiently; hence, with all the sections in the parallel connection the lowest velocity may be obtained. If in either of the connections shown in Figs. 2, 3, 4 the current is less through the field wires than in Fig. 1, the speed will be higher. From this it will be seen that the velocity is dependent upon the amount of current used, and this is true of the arrangement of cutting out the field sections, except that in that case the current cannot be increased beyond the limit used with all the coils in service, unless the sections are made of different sizes, and the armature is capable of carrying as much current as the largest field wire.

As the velocity is dependent upon the strength of current, it follows that these arrangements are not well adapted to practical wants, because in almost every case it is desired to vary the speed and the pull in certain ratios, that are not very apt to be in accordance with the corresponding changes in the velocity and torque of the motor.

Fig. 5 shows the character of switch used with this method of changing the velocity. The part *M* represents the shape and connections of metal plates placed upon the surface of a cylinder, and the contacts 1 to 8 are so arranged that they may press thereon. When the contacts press on the cylinder along the line 1, contacts 2 3—4 5—6 7 are connected and the current passes through the sections in series as in Fig. 1. On the line 2 the connections are 1 3—2 4 5—6 7 as in Fig. 2. On the line 3 they are 1 5—2 3—4 8—6 7 as in Fig. 3; and on the line 4, 1 3 5 7—2 4 6 8 as in Fig. 4. In Figs. 2, 3, 4 and 5 the field poles of the motor are not shown, so as to render the wire connections more plain.

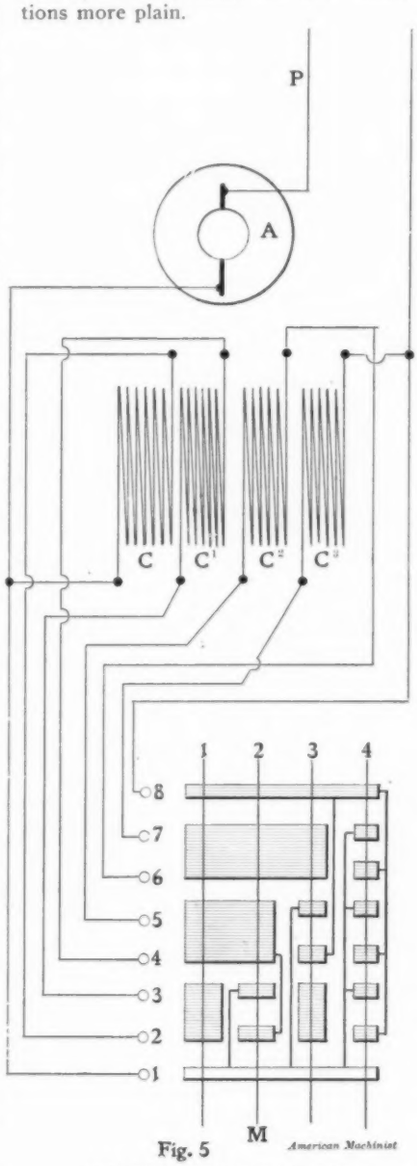


Fig. 5

COMMUTATED FIELD FOR SERIES MOTOR.

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Erratum.

In the article on "Negative Efficiency" which appeared in our issue for November 12th, second column, near the top, read:

$\frac{de}{df}$ = efficiency for lowering.

▲ ▲ ▲

Efficiency of Electric Railways.

An article by Mr. R. D. Williams, in our issue of August 27th, called attention to the fashion among electrical engineers of "claiming everything" in the matter of efficiency for all kinds of electrical machinery, and also pointed out that the efficiency obtained from stationary motors under favorable conditions could not properly be applied to railway work, which Mr. Williams characterized as "probably about the least efficient" of all the applications of electrical power.

The matter is of special interest at this time, when the compressed air car is forcing its way to the front. Of all the many reasons which have been given by the zealous electrical press to show why the air car could not compete with the electric car, none has been harped upon so much as this one of its supposed hopelessly inferior efficiency. It is patent to all who have followed the trials of the air car, that from the standpoint of the mechanic and the public, the results have been not only favorable, but extremely and unusually so, considering the stage of the game. No one who has any knowledge of the early history of electric traction, and of the trials through which its advocates went, can fail to be impressed with the opposite experience of the air-car promotors. The air car had only to obtain a hearing, so to speak, and find a chance to show what it could do, when it proceeded to silence all criticism of its operating qualities.

It has not been easy to obtain figures regarding the actual efficiency of the electric car. Electrical engineers of wide experience and knowledge in this field with whom we have conversed on the subject, have owned to their ignorance of what the results really are, and if others are in possession of such facts they have until recently carefully kept them to themselves, and meanwhile the electrical press has been industriously using the results obtained with stationary motors, as though they were of universal application to all uses of electric power.

In a recent issue of the "Electrical World," we find at last some definite figures on this subject, in an article by Mr. H. P. Brown, and they furnish a striking commentary on the claims that have been put forth. Mr. Brown says: "The power efficiency of several leading roads has been found to be less than 45 per cent. at heavy load." Moreover, "Each of these roads has a finely equipped power plant, multipolar dynamos, modern types of motors with series-parallel control, excellent tracks and apparently ample feeders."

This, then, is the efficiency against which the air car must compete, and it does not look to be such a desperate competition as has been assumed, though it does not give the whole case. The electric road operating as it does without any reservoir or buffer between generator and car, its output must vary with the demand, which, as is well known, is subject to the most violent fluctuations. This, again, is well known to be fatal to high steam economy, and, regardless of what the power efficiency may be, the steam efficiency of an electrical traction plant is bound to be low. In this respect the air plant has a distinct advantage, as the air reservoirs are exactly the thing which the electric plant lacks—a reservoir to absorb the

fluctuations of the demand, and give the engine an almost absolutely constant load, with all the opportunity for steam economy which a steady load affords.

Of course, we may be told that the efficiency of electric roads may be increased, and that the storage battery will doubtless soon be used to perform the service of the air receivers in the compressed-air system. This would, however, be begging the question, as the comparison is necessarily with what is, and not what is to be.

The above figures for efficiency demonstrate what we have always believed, that the mechanical efficiency of the electric railway has had little or nothing to do with its development and progress, but that that progress has been due to its giving better service and cheaper traction than horses, neither of which advantages involves high mechanical efficiency at all. The air car must, of course, furnish as good or better service, and as cheaply or more cheaply, than the electric car, and that is all there is of it. To suppose that the question hangs on mere mechanical efficiency is an opinion which is not worthy of anyone calling himself an engineer.

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Increased interest is being shown in England over electric traction, and the long-deferred "boom" in that class of work is now confidently spoken of as in sight. English electrical papers are speaking a good word for their home manufacturers of this class of machinery, and hope to see the work done by them. The "Electrician" considers that there are a dozen British firms who are competent to install traction machinery that "would not suffer in any way by comparison with the American article." We take this to be at least an admission that in this field of work American machinery is the standard of comparison. Few realize the extent to which American electrical engineers have set the pace in this field. Electric traction is essentially American in inception and development. So far as England is concerned, the restrictions of the Board of Trade have undoubtedly been a heavy burden. Our engineers have, on the other hand, had a comparatively free hand; and while many costly mistakes have been made, they are probably inseparable from pioneer work of this character and magnitude.

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It is reported that the Japanese Government is to undertake the construction of telephone lines on a grand scale. Sixty millions of dollars are to be expended during the next seven years, with the expected result of the most perfect system in the world.

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Direct-coupled American steam engines have been introduced into an extension of the Bristol (England) electric tramway power station. This move is made after experience with the Willans engines originally installed.

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Prominent citizens and the various commercial and industrial bodies of Buffalo are preparing to celebrate the arrival of the Niagara electric current in that city in a large and appropriate manner.

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Electric power from Niagara Falls is now being delivered in the city of Buffalo. The current is to operate the street railways of the city.

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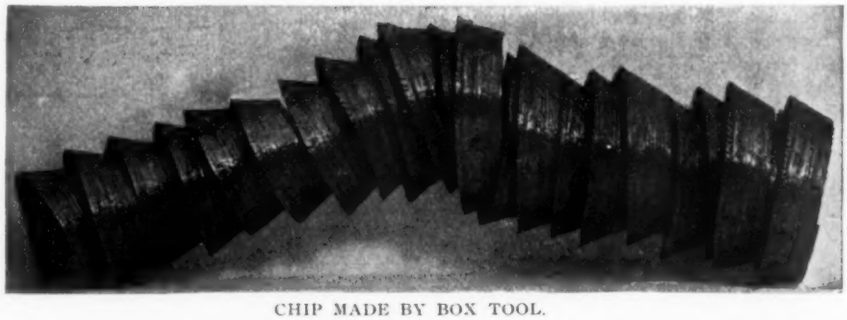
Letters from Practical Men.

Box Tools and Hollow Mills—Oil-Guards and Chip-Pans—Ball Bearings for Grinders.

Editor American Machinist:

I note your article in recent issue of "American Machinist," written by Mr. S. T. Freeland, in which he brings out my name in connection with the cuts of the Niles box tool, and I send you herewith photograph of the one he refers to as used in the Hamilton-Kenwood Cycle Company's factory. I also send you a chip taken off by this box tool, which I trust you may have photographed and given place in your paper as being some of the

A BOX TOOL.



CHIP MADE BY BOX TOOL.

work this box tool will do. This is taken from 1⅛ axle stock and is cut at a speed of 43 feet per minute.

I would like to ask the readers of the "American Machinist" if they ever saw a hollow mill that will even approximate such a cut as this. This chip is no exceptional case, and our piece-work rates are based on the operators taking off such cuts at all times on this job.*

If one will stop to consider the relation of cutting angles and resistance angles in both hollow mills and box-tool work, it can be readily seen that by no possibility could a hollow mill be made that would stand up under such pressure.

I do not advocate the use of the box tool as illustrated in the issue of this paper referred to, but would call attention to the fact that in the photograph submitted herewith the cutter does not leave a square shoulder upon the work, but is set at an angle with the axial line of about 60 degrees. This throws the chip away from the work, making a much easier cut; for, as we all know, the bending resistance of the chip is much greater than is apparent at first glance.

The writer is somewhat of a crank on the subject of turret machine tools, and has almost unbounded faith in the capacity of screw machines to produce work of commercial accuracy. The bicycle trade has developed this phase of mechanical knowledge probably more than any other department of mechanical work, for up to the time the "bicycle craze" set in, such operations as making bicycle hubs from a solid bar were unknown.

When one looks back over fifteen years of machine-shop practice, and remembers the little chattering apologies for machine tools that were in common use at the time, and then thinks of the marvelous development and consequent lowering of cost of production during that time, it makes one almost believe that Mr. John J. Grant's prophecy of specialized machinery will be carried out in its entirety.

In speaking of rapid production, one notices how much more attention is now being given to the question of direct lubrication of cutting edges. Until within a very short time no turret machines were sent out with any adequate facilities for flooding the work with lubricant, and it is a sad fact that even yet some of the larger concerns build such machinery imperfectly supplied with any adequate pumps, guards or oil reservoirs. Allow me to ask the turret machine makers why not "take the bull by the horns" and design their machines so that, when they are received by the user, the pumps, reservoirs and proper guards are all in place and ready to use? In any shop in the country that uses such machines the work of the tin-

* The chip is shown full size. As near as we can judge, the feed was about 30 per inch.—Ed.

smith is very much in evidence, in the shape of sheet-iron guards to protect the operator from the splashing of oil. Any machines of the size of a No. 3 P. & W. turret lathe should have a tank with a capacity of, at least, 25 gallons, and the chip-pan should be 6 inches deep and large enough to catch all the drip and work as it falls from the machine, and with cast-iron sliding guards that will protect the operator from the oil. While these things are small and perhaps inexpensive, yet it is these little things that make maximum production possible, and when a man must spend minutes of each day in replenishing oil and clearing away the chips, it means hours and dollars in a season's work.

Another blessing conferred by the bicycle trade on the general mechanical public is the educating of the steel makers to a point where good high carbon steel is furnished annealed so soft that it compares in this respect to an ordinary Bessemer. How well I remember, in the years gone past, the rough tool steel that I had to work, annealed by the blacksmith in ashes, and the vast amount of time and profanity spent in continually grinding tools until the job was finally hewed out! All these can now be done away with; and what a source of comfort to the tool-makers that it is so!

A point that I have not as yet seen mentioned in the "American Machinist" as having been successfully tried, is the application of ball bearings to rapidly running journals. We have in the Hamilton-Kenwood works a machine designed by the writer for grinding the internal surfaces of ball-bearing cases for bicycles. As the wheels are ¾ inch diameter, and the work must be handled by cheap labor, it is evident that the speed must be high if the emery is to do any work. The spindle carrying this wheel travels between 4,000 and 5,000 revolutions per minute and runs upon balls of 3-16 inch diameter, and has passed through one season's work with no attention, except occasionally being adjusted for slight wear. It seems to me that this is a good showing and that the principle could be well applied to other similar machines, for this one certainly has served its purpose extremely well, and has not cost a cent for repairs or attention for over six months.

When I have courage enough to spend some of the firm's money on a special machine of heavier nature, I am going to try what the ball bearings will do in such operations as milling and turning. Certainly the power saved would be great if it can be practically accomplished.

I have been much interested in the articles lately published on bicycle work, and wish that superintendents of bicycle factories could be induced to contribute articles on various processes. The common fallacy of supposing that bicycles selling at $100 have been a bonanza to manufacturers, having been exploded by the numerous failures of the past season, it behooves bicycle builders to get down to rock bottom on cost, and certainly nothing is better than a clear discussion of methods employed.

A. W. PARKHURST.

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"An English Planing Machine"—Not the Richards Idea.

Editor American Machinist:

In your issue of the 15th instant "an English planing machine" is described and illustrated, which was designed and made by my firm. In the concluding paragraph of the article there is this comment: "The machine appears to be an elaboration of the Richards side planer idea." This is not the case, and I therefore request you to correct the statement.

The "side planer idea" was patented by myself on the 9th June, 1865 (Patent No. 1571, Fig. 7, page 6). Mr. Richards and others have followed on the same lines, with little or no modification.

The machine which has been noticed in your paper was an elaboration of my own original invention, and was designed at my Ordsal works, to operate on large forgings in connection with shipbuilding.

WILLIAM W. HULSE.

Manchester, England.

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Variations in the Pitch of a Long Screw.

Editor American Machinist:

There appeared in the column of Questions and Answers of the "American Machinist" for November 12th, a question as to what would be the effect of twist, caused by a heavy cut, on the pitch of a screw. The answer is that the torsional movement will be greatest at the end farthest from the dog, and that there will be little or no twisting near the dog. Now, this should be read with some caution. As a matter of fact, the chance to break the screw by twisting is equally great (or small) at all points between tool and dog; the amount of torsional movement per inch is constant, and this makes that the total amount of movement is the greatest at the far end of the screw.

Therefore, the effect of twist on the pitch of the screw is constant over its entire length, if there is any effect at all. And this I doubt. The length of a shaft is not changed when it is twisted. It is true that the outer fibres are forced to arrange themselves in a spiral of which the length is greater than the length of the shaft; but this is done by stretching these fibres, not by shortening the shaft.

However, there is another cause which tends to lengthen or shorten the screw. This is the side pressure of the tool, caused by the feed. This side pressure will lengthen the shaft when cutting away from the dog, and shorten it when cutting toward the dog. In the first case the pitch will be too fine; in the second, too coarse. However, it seems to me that the effect will be too small to be taken into consideration, except when unusually accurate work is required.

A. L. DE LEEUW.

New York.

[Our correspondent seems to think that the variation of pitch, if any occurred, would only be on account of a change of length which might result in consequence of the twisting. The real cause of the variation of pitch would be in the twisting itself, and in the fact that the cutting tool, with the same longitudinal advance, would encounter the screw at a different point of its circumference from that at which it would cut if no twisting occurred. It is possible that some others of our correspondents might have a word to say upon this rather interesting topic.—Ed.]

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The Speed of Machine Tools—Experience with a Planer at High Speed.

Editor American Machinist:

I read with a great deal of interest the letters of Mr. Griffin, Mr. Bonsall, Mr. Johnson and my father, in your issue of November 12th.

In regard to Mr. Johnson's inquiries, I will state that the class of work on which the facts noted in my previous letter were based was the planing of engine slides which were, on the average, about 4 inches wide, 3 inches thick and 3 feet long, of a good hard, sound quality of cast iron made of one-half scrap and one-half pig, the latter of two or more different brands. The roughing cuts average about $\frac{3}{16}$ inch in depth, with about $\frac{3}{16}$ inch feed, and were made with a tool resembling a half diamond point with the cutting side face nearly perpendicular. The finishing cuts were made with a square-nose tool, removing just sufficient stock to take out the tool-marks made by the roughing cuts, the feed being from ½ to $\frac{5}{16}$ inch. There was not the slightest jerk in the reversing motion of this planer at the speed mentioned, so that a piece of iron 1 inch square and 6 inches long could be stood on end on the platen without being tipped over at the time of reversal. We had tried the different rates of feed, depth of cut and speeds, not so much as an element of saving power, but to determine the largest amount of work that could be gotten off a given machine tool without slipping the belts, whose width was limited, of course, to the pulleys with which the machine was equipped.

I am very glad to see that Mr. Bonsall's experience coincides with mine in regard to the greater accuracy of work under these conditions. We did not intend to go into a scientific determination of the strains and stresses applied to the machine, but simply to determine the practical question of how to obtain the most work from a given tool within the com-

mercial limits of the machine. Twenty pieces of the size given above were finished in ten working hours, which included the planing of the four sides and squaring the both ends.

WM. O. WEBBER.

Boston, Mass.

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Speed and Power of Machine Tools —Speed of Planers.

Editor American Machinist:

Having read with much interest the several communications regarding production as compared with power expended in operating machine tools, and especially in reference to planer speeds, I offer my views on the subject, based on experiments of my own, to determine the greatest profit to be derived from the use of machine tools.

I think the point raised by Mr. F. L. Johnson, of Lynn, Mass., well taken, for the essence of the whole matter is—having so many cubic inches of material to be cut off, or so many square inches of surface to be tooled over, how can it be done at the least cost? Now, the speed of the tool is only one of the things to be considered; the first thought should be given to the nature of the material to be cut—if hard, very hard or soft. Next is the shape of the piece, such as will allow of its being firmly held or secured while being machined; and is the direction of the cut, and the length of same, sufficient to warrant a maximum speed? It seems to me that in the case of a planer on which miscellaneous work is to be done, a counter-shaft with cone pulleys should always be provided, so that suitable speeds can be given to the work in hand, after duly considering each case, as above indicated. For instance, suppose we have a flat platen 5 feet wide by 8 feet long, which it to be planed over its entire surface; here we have a case where we can, if the material is ordinarily soft cast iron, employ a high speed to advantage. We can run a cutting speed as high as 25 feet per minute, and with chilled cast iron tools even higher. If, however, the iron is hard, we must go slower, possibly increasing the feed, if we can hold the work firmly, finishing at a high speed with broad feed. As another instance, suppose we have a very heavy casting that requires planing on one end, and when stood up on the platen is likely to vibrate, even with the best appliances to hold it; and further, that the cut is short and the surface so far down in the casting as to require a long projecting tool to reach it. Here, I take it, we have a case where a slow speed is best, using as heavy a feed as we can employ, and as deep a cut as well. To use a high speed would shake things to such an extent as to probably lead to some kind of a breakdown, and cause a delay greater than the gain by using the higher as against the slower speeded cut.

I fully indorse the views of my brother, W. O. Webber, and others, that the cost of the power is not worth considering as against the time required. Machine-shop tools require so little power that the item of power cost in a machine shop is small compared with the wages and general expense account; only I do not think we can run high speed in all cases to such good advantage and profit as by sometimes using slow ones. We have, too, all seen instances where "haste makes waste." I would advocate having planing machines provided with a change of belt speeds, so the workman could avail himself of such cutting speed as best suited the work in hand. Our boring and turning mills are so provided, and for many jobs are used instead of planers on that account, besides having the great advantage of continuous cutting action. It seems at first odd that it should require so much more power to run the planer on the return stroke than on the cutting one, but the high speed of all the moving parts takes vastly more power than is required to force the tool through the metal at the slower rate.

S. S. WEBBER.

Trenton, N. J.

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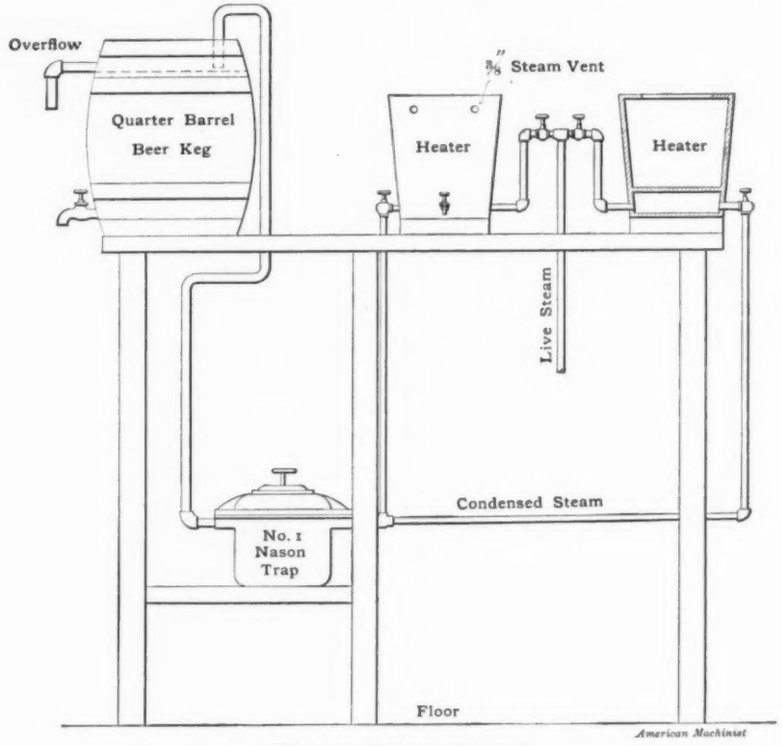
Steam Glue-Pot Heater.

Editor American Machinist:

Inclosed find sketch of a steam glue-pot heater we have been using here with very satisfactory results. It is a very simple affair, but a number of our visitors have been so pleased with it as to ask for sketches, and perhaps some of your readers might find use for a similar arrangement.

The kettles are cast iron, double-bottomed, made by Pancoast & Maule, Philadelphia. The steam pipe is carried 3 inches higher than inlet to kettle, so that none of the condensed steam can run back into main steam pipe. A couple of ⅜-inch holes, drilled near top of kettle as shown, will effectually prevent boiling over when glue-pot is in place and full head of steam is on. The keg supplies all the hot water needed for mixing glue, washing joints, etc.

This arrangement can be got into a very small space, and the keg can be put at almost any distance from the kettles, to suit one's convenience.



STEAM GLUE-POT HEATER.

EDGAR KIDWELL,
Michigan Mining School.

Houghton, Mich.

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The Inventor's Scrap Heap — A Roller-Bearing Failure.

Editor American Machinist:

What I may happen to say just here is I suppose somewhat attributable to the extracts from the address of the late J. F. Holloway, printed in the "American Machinist" of October 22d. One sentence of that address particularly stuck to me. He says: "None will ever look upon James Watt's scrap heap," and then he goes on to tell about how the best and the wisest of men have their failures as well as their successes, while the world generally knows only of the latter. I suppose that is so; and yet I sometimes think that a better knowledge of those unrecorded

failures would also have been of value to us. It is certainly encouraging to know that the best and the brightest are made of the same stuff as we everyday fellows, and that if our make-up is somewhat defective, they also were not flawless.

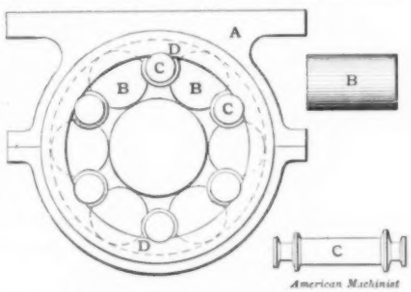
I do think, though, that the best inventor or designer, like the best manufacturing establishment, has the smallest visible scrap heap. As the scrap heap of, say, the engine builder should be in the pile of dust-laden drawings on the upper shelves of the drawing-room rather than in the pile of old iron out behind the cupola, so the most successful contrivers of ingenious mechanisms have their scrap heaps in their heads, and not generally where the public ever has a glimpse of them. It is quite doubtful whether James Watt ever had such a scrap heap as, for instance, the notorious Keeley of our times could show. If Keeley, up to date, has ever produced anything but scrap, the public has not heard of it.

Some defective ideas that strike the engineer get farther than others, and some do get completely embodied in iron or steel before the worthlessness of them is realized. The mechanical world is very much interested just now in roller bearings, and I have the pleasure of presenting herewith a sketch of a roller bearing that I really think is one of the neatest and most ingenious yet devised. The only, or at least the principal, objections to it, so far as I know, are that, first of all, it costs a great deal to make, and secondly, it will not work at all. It is in fact a thing that I have dug out of the scrap heap of my memory, but which was designed by one of the most honored of American engineers, not now living, and under his direction fully made of iron before all its properties were realized.

This roller bearing was got up for the axles of tracks to run into annealing furnaces, where they would get very hot, and where, of course, no lubricating material could possibly be employed. For each bearing the main casting was a large ring *A*, made in halves, as shown, so that the rollers could be got in, bored to the required size and faced to width. Then there were the six plain rollers *B B*, placed around the axle and extending to the interior of the ring bearing, and keeping the axle central. That constituted the entire roller bearing, so far as the bearing surfaces were concerned; but it was, of course, necessary to keep the rollers in their proper places. The smaller and longer rollers *C C*, with the flanged hubs on each end, were used to space the main rollers. Two plate rings *D*, one on each side, that had no work on them except the boring of the inner edge to the required diameter, fitted over the projecting hubs of the small rollers and were expected to remain concentric with the axle, being kept so by the small rollers, they thus keeping each other and also the main rollers in their proper places.

If everything had worked according to the theory under which the bearing was devised it would have made a very neat roller bearing, and the rings and rollers would have moved around without friction except where the face of the plate rings came against the sides of the main casting. But the trouble that developed immediately with the first trial was that the small rollers and the rings postively refused to stay in their proper places. They would rather be almost anywhere than in their proper concentric positions, and the bearing was immediately abandoned.

The reason for the failure is sufficiently evident. Looking at any opposite two of the smaller rollers, and their bearings against the main rollers, it will be seen that if any roller moved radially outward it would be favored by an increasing angle between the two rollers in contact, while the opposite roller moving inward would meet a decreasing angle, so that there would be a standing invitation for the rollers to move out of their positions



A ROLLER BEARING FAILURE.

rather than to stay in them. Yet I cannot help thinking that this arrangement of rollers for a bearing is worth looking over a little more, and that there may be a possibility yet of making something out of it, so that in bringing it to the attention of the readers, or in digging it out of the scrap heap, I may have done a service for someone.

TECUMSEH SWIFT.

▲ ▲ ▲

Stationary Bed for Open Sand Castings.

Editor American Machinist:

Don't you you think it would be a good thing for foundry proprietors (if they have space to do it) to make a stationary bed for making open sand castings? It will save time and a great deal of trouble.

The foreman comes into the shop with an order for a lot of open sand flooring plates, 6 x 4 feet; gives the order to Jim Bowers; Jim says: "Where are the strips?" "They are around somewhere," says the foreman. Jim starts off around the shop to hunt them up. After an unsuccessful search for about an hour Jim asks one of the men if he had seen them. He says: "I saw the cupola man with them last." Jim makes for the cupola, sees the man: "Say, what did you do with those strips you had the other day?" "What strips?" "Why, those strips you carried away from the corner over there?" "Why, were they any good? I did not think they were. I broke them up for fire-wood to dry the ladles." So Jim has to go to the carpenter's shop to get some more made. After an hour waiting he gets them and starts in to make his bed. It will take him at least three hours to get his strips leveled and the bed ready. So half of the day is gone.

The way I do is to get two railroad rails, and six blocks, 2 x 4, about 6 inches long; put three of the blocks under each rail, one at each end and one in the middle. The object of the block is to raise the rail up from the level of the floor so the molder can get his vent wire under the rail; get a wire that will reach to the center of the mold, and then there will be no danger of scabbing. By this plan a great deal of time can be saved, and there is no danger of the strips being burnt up to dry ladles with.

THOS. WATHEY.

Cleveland, O.

▲ ▲ ▲

The Reamer Question.

Editor American Machinist:

Mr. Almond's idea for improving the reamer of commerce looks real good. I hope others who think well of it will try it, and, as he suggests, give us the results of their experiments. In earlier days I worked about a shop in which various sizes of ball reamers, for reaming the seats of ball and socket joints, were used. In size these reamers were from a half inch up to seven inches diameter. In making these reamers, to prevent chattering the invariable practice was to grind them very slightly, as Mr. Almond speaks of with reference to straight hand reamers.

Any piece of iron that would serve the purpose was caught in the lathe chuck and reamed with the new reamer. Instead of using Arkansas stone for grinding very finely, pulverized quartz was employed—too fine to be of much service for grinding joints. To the reamed surface in the chuck, oil was applied; a small quantity of the quartz powder was dusted over, the reamer put in position as to continue the reaming, and the lathe given a few turns backward. There was never any doubt about the reamer being a better tool for it.

In the same shop some field guns were being rifled. The means employed for giving the spiral motion to the rifling bar on a planer, suggested to some experimenting machinist the policy of rifling the flutes of a straight hand reamer. We put his plan into operation and made a spiral-fluted reamer. I left that part of the country too soon to know how the spiral flutes worked as a preventive of chattering. Of course, spiral flutes are common enough in these times; but how much, if at all, they will prevent a hand reamer from chattering is another question.

Just about this time a much larger hand reamer than any in the works was required. The "governor" took a hand at this. With chattering in his mind, an iron forging was made and mounted on the planer centers—milling machines were not common then—and a plentiful number of rectangular grooves were placed in it. In these grooves an old steel-worker welded cast-steel pieces, and the reamer was finished precisely as if it were all steel, one tooth coming in the small clearance on the cutter and hardened it. A hand-wheel was found in the scrap pile, and this was fitted to end of boring bar. A yoke was then bent up out of ⅝ x 2-inch bar iron, and this was tapped for a long ¾-inch feed screw which was operated by a wrench fitting the squared end. This yoke was secured to the cylinder by the short studs used to fasten cylinder cover in place, and was at right angles to the position shown in Fig. 1.

The stuffing box formed one support

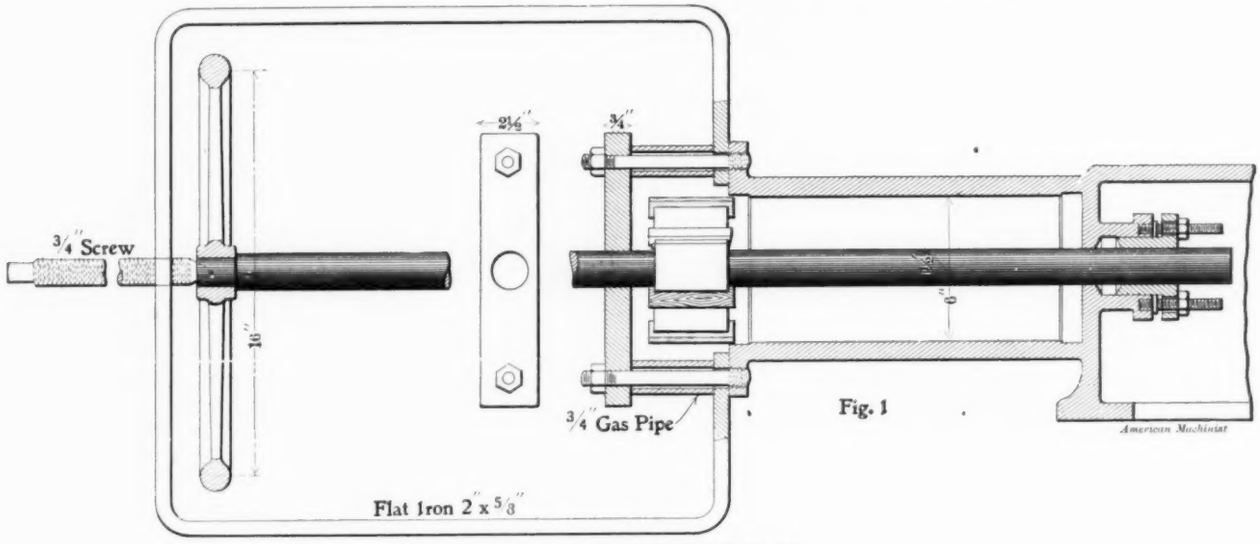


Fig. 1

REBORING A CYLINDER BY HAND.

steel and another in the iron. Just how successful this composite reamer was I do not know.

F. F. HEMENWAY.

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Reboring a Cylinder by Hand.

Editor American Machinist:

Some time ago I saw an interesting piece of work in a little country town, where the local machine shop was an adjunct to a horse-shoeing establishment, which shows that the Simon pure machinist is still on deck. The shop could boast of one 18-inch lathe, a small planer, of the architectural style, and a blacksmith's post drill. A job came in one day to re-bore an engine cylinder which had been cast with the bed. The cylinder was only 6 inches in diameter and could readily have been re-bored in the lathe if it had been removable from the bed, but under the circumstances this could not be done. The "old man" sized up the job and bored it in place with the rig shown in Figs. 1 and 2. He found an old boring bar of suitable size, and on this he keyed a cast-iron head, as shown in Fig 2. This head was slotted with a number of dovetail grooves about ½ inch deep by ⅝ inch wide at bottom, and into each of these grooves but one he fitted pieces of hard-wood (maple) and turned the head to size. In the remaining groove he fitted a steel cutter and secured it with a key, then turned this to size, after which he filed a for the boring bar, and the other was made by drilling a 1½-inch hole through a piece of ¾ x 2½-inch bar iron, which was held at a suitable distance from the bore by long stud bolts passing through thimbles of ¾-inch gas pipe cut to length and faced in the chuck. The arrangement was operated by hand, which was pretty hard work for the chap at the hand-wheel;

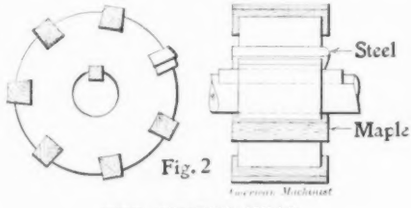

Fig. 2

THE CENTER HEAD.

but the result was an excellent job, and the time for the whole work was surprisingly short.

CHIP.

▲ ▲ ▲

A Simple Eye Remedy.

Editor American Machinist:

A simple eye remedy, particularly when the foreign substance is of a size and color which cause difficulty to withdraw or pick out, is a slip of clean news or tissue paper, about ¼ inch wide, placed between the eye and lid; let the lid close upon it, then draw out, and it should drag out the cause of the trouble. P. A.

The Correspondence School of Technology, Cleveland, O., has recently increased its force of instructors by adding Mr. I. H. Sherwood, B. S., a graduate of Case School of Applied Science. Mr. Sherwood worked as a machinist before going to college, and worked his way through college by working as a machinist and running the college engines, and is therefore able to fully appreciate both the value of an education and also the difficulties and trials met by those who have to obtain same through their own efforts. He is now a licensed Stationary Engineer, and Assistant Instructor in Electrical Engineering of the Cleveland Y. M. C. A. Course.

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We must again remind our readers that an address such as Philadelphia, New York, Chicago, or any other large city, without street and number, is not a complete address, and we are often prevented from replying to communications because street and number are not given. Any communication which the writer does not care to attach his name and full address to need not be sent to us.

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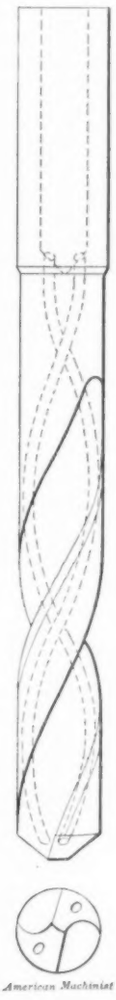
Heretofore it has been the aim in the construction of jails to have the bars so hard as to make the cutting of them very difficult. In spite of this, convicts have succeeded in finding methods of taking the temper out of the hardest steel. A new type of prison bar has recently been tested in Boston successfully, in the shape of hollow pipes which are filled with water under high pressure. When these pipes are severed the water escapes, and by a system of registers in the office of the jail the fact that the pipes have been cut, also the location of the cell where the pipes have been assailed, is made known. It is not necessary that the pipes be exceptionally hard; common gas pipe answering the purpose as well as any other

Drill With Drilled Lubricant Tubes

We have shown in former issues several varieties of twist drills provided with tubes for conveying lubricant to the points of the drills; these tubes being let into small grooves milled in the outer surface of the drills and soldered in place.

We now illustrate a drill belonging to this class which is still more of a novelty, and which will interest the machinist not only as an efficient tool, but one the production of which, to be sold in competition with others, presents an interesting problem in practical mechanics.

This drill is just like any other (by the



American Machinist

same manufacturers), except that, as shown, two holes pass entirely through it to the shank, where they unite with a larger one, and the lubricant is thus forced through tubes formed in the solid metal, and which cannot come loose or require any special attention.

In making these drills, the holes are first drilled in the blanks straight through. The blanks are then twisted to the proper spiral, finished, and the grooves milled.

The drill shown is that known as the "constant angle" drill, from the fact that the angle of the groove spiral is uniform throughout the length of the drill, but the groove is made wider as it approaches the shank, to give an equal area of groove with a decreased depth or increased thickness at the center.

Our readers are already sufficiently familiar with the surprising efficiency of these lubricant-tube drills to make remarks on that feature unnecessary.

The drill illustrated is made by the T. & B. Tool Company, Danbury, Conn.

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Seventeenth Annual Meeting of the American Society of Mechanical Engineers.

The seventeenth annual meeting of the American Society of Mechanical Engineers will begin at the house of the society, 12 West Thirty-first street, New York, at 9 p. m. on Tuesday, December 1st. At that session President John Fritz will deliver an address entitled "Progress in the Manufacture of Iron and Steel in America and the Relations of the Engineer to It." The balance of the evening will, as usual, be spent in social intercourse, and there will be luncheon. On Wednesday morning the annual business session will be held, at which reports of officers and various committees will be presented and the general business of the society transacted.

Professional papers to be presented at this meeting are as follows:

An Historical and Technical Sketch of the Origin of the Bessemer Process. By Sir Henry Bessemer.

Ancient Pompeian Boilers. By Wm. T. Bonner.

The Moment of Resistance. By C. V. Kerr.

Work Done Daily by a Refrigerating Plant, and Its Cost. By Francis H. Boyer.

Promise and Potency of High-Pressure Steam. By R. H. Thurston.

On Wednesday evening a reception will be given at Sherry's, Thirty-seventh street and Fifth avenue. There will be an officers' reception at 9 o'clock, supper at 10.30 and music for dancing.

On Thursday morning professional papers will be presented as follows:

Experimental Investigation of the Cutting of Bevel Gears with Rotary Cutters. By F. R. Jones and A. L. Goddard.

The Calibration of a Worthington Water Meter. By J. A. Laird.

Contraction and Deflection of Iron Castings. By Francis Schuman.

A 200-foot Gantry Crane. By Jno. W. Seaver.

Washing of Bituminous Coal by the Luhrig Process. By J. V. Schaefer.

Friction Horse-power in Factories. By C. H. Benjamin.

There will be a session on Thursday evening, at which the following professional papers will be read:

Some Special Forms of Mechanical Computers. By Frederick A. Halsey.

Rustless Coatings for Iron and Steel. By M. P. Wood.

A Method of Shop Accounting to Determine Cost. By H. M. Lane.

The closing session will be held on Friday morning at 10.30, at which professional papers will be presented as follows:

The Efficiency of the Boiler Grate. By W. W. Christie.

Efficiency of Boiler Heating Surface. By R. S. Hale.

Paper Friction Wheels. By W. F. M. Goss.

Steam Engine Governors. By Frank H. Ball.

Metric vs. the Duodecimal System. By Geo. W. Colles, Jr.

Aluminum Bronze Seamless Tubing, By Leonard Waldo.

The Photographing of Machinery. By Leonard Waldo.

As usual with the New York meetings, the afternoons are left without assignment, so that members may have an opportunity to follow their own inclinations, and may remain at the society's house or visit points of interest about the city. It is expected, however, that Wednesday afternoon's session will be devoted to something in the way of a memorial of the late J. F. Holloway, Past President of the society.

It is announced that the summer meeting of 1897 may be expected to be held in Hartford, Conn.

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On the front page of our issue of November 12th the Jos. Dixon Crucible Company quoted from the report of the Chief Engineer of the Brookline Water Works regarding the reduction of friction by the use of "Dixon's Pure Flake Graphite," and either our printer or their writer left out the little word "to," thus making it appear that the graphite reduced friction one-third instead of two-thirds; the latter being the real result, according to the engineer's report.

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Extracts from Engineer-in-Chief Commodore Melville's report have appeared in the daily papers. Regarding the engineer force he states as follows: "The personal element is one which must enter largely into the result of any naval engagement, and if we had the most powerful and the swiftest navy afloat, it would be valueless to us in time of war if we have not a sufficient number of trained men to see that the machinery of this fleet is in condition for action, and to keep it going in action. The guns will be powerless without the machinery, and other things being equal, that fleet will give the best account of itself which has the best equipment of trained men in the engine-room as well as at the guns. To sacrifice the one is merely inviting disaster to the whole, and no amount of skill on deck can compensate for the lack of it below."

American Machinist.

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Fred J. Miller, Editor.

Frank Richards,
F. A. Halsey,
Edward P. Buffet,
} Associate Editors.

A. L. Donnell, Dept. of Illustration.

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Space in advertising pages only is for sale.

We invite correspondence on subjects pertaining to machinery.

Name and address must always be given, though not necessarily published.

Communications for or relating to the reading columns should be addressed to the Editor. All business communications should be addressed to the Company.

Subscribers can have their mailing address changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once. Date on wrapper denotes week with which subscription expires.

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Testing in the Schools.

Most of our readers are acquainted in a general way with the large collections of machinery and apparatus which our engineering schools maintain, the chief purpose of which is the making of tests and the instruction of students in testing. These collections make an imposing appearance, and no doubt produce a powerful effect on visiting parents of actual or prospective students; but, after all, is it a correct policy to give so much prominence to the testing side of engineering? Perhaps we lack in discernment, but nevertheless we are not able to understand wherein any very profound engineering knowledge or judgment is involved in weighing the coal and water for a boiler test, or in the simple calculations involved in working up the results, and the same remark applies to engine and other tests. Horse-sense and a knowledge of the ways that are dark and tricks that are vain are often involved in detecting the efforts of interested parties to deceive the expert in charge of tests, but such conditions do not, in the nature of things, obtain with school tests.

The real brain-racking problems of engineering relate to construction, and are solved over the drawing-board and in the shop. Moreover, the average engineer must, of necessity, devote himself to construction, and in view of this fact it seems to us that there is altogether too much time devoted in the schools to testing, and too little to construction. Furthermore, this constant magnifying of the importance of testing has an erroneous and unfortunate effect upon the minds of the students, and it is largely to this, we believe, that the exaggerated ideas of the importance of mechanical efficiency —and a general tendency to impracticable refinements—so prevalent among students and recent graduates, are largely due. In most lines of work there are few things which machine builders or buyers consider of so little importance as efficiency in this sense. How many boilers or engines, for example, are bought with a view to securing high efficiency, unless accompanied with desirable working qualities? And how many men of judgment would buy, either, if of a type which, while securing high efficiency, would sacrifice good working qualities? Very few, notwithstanding the fact that efficiency in boilers and engines is of more importance than in any other class of machinery, except, perhaps, the electrical.

Machine building is primarily a matter of business, and not of science, and this worship of tests and efficiency tends directly to obscure this fact and to lead to the reverse conclusion. With the dearth of accurate information in many lines where sorely needed, and with the opportunities which the apparatus of the schools afford for making experiments of real value, it seems to us they are missing many of their opportunities for usefulness, to both their students and the world at large; for experimental research of this kind cannot but have a far more beneficial effect, and tend to put the student in far better touch with the real problems that confront the engineering world, than does the present program. With the opportunities afforded by the school shops for constructing machines and apparatus and conducting experiments, almost without cost, a more useful class of information should come from them than has so far been the case.

Of course, we are aware that research directed toward the acquisition of information is carried on to a considerable extent at some of our engineering schools, but this does not alter our opinion that more should be done, and that a good portion of the time now given to testing could be devoted to research with benefit to all concerned.

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A Naval Engineer Retired—Sailing Vessels for Practice Here—Archery for Practice in China.

The daily press has announced the breaking-down and retirement of Passed Assistant Engineer McAllister, of the Navy, who broke down on the "Indiana." Chief Engineer Tower, who broke down at the same time, is still laid up in the hospital.

These break-downs, as well as the numerous others that have occurred, are, of course, due primarily to lack of sufficient men in the engineer department, and the anxiety of engineers to prevent as long as possible the complete and disastrous wrecking of some naval vessel's machinery, which all feel to be inevitable sooner or later. But the work of breaking down engineers is helped on by the despicable system of annoyance and interference by which a naval engineer's life is made as miserable as possible.

In the face of these numerous break-downs we think few would be able to maintain a bold front and defend the cause of them, except one who during his first year at Annapolis is imbued with the idea that he has a certain "birthright" of superiority and has been born to command men of inferior clay.

We referred recently to a recommendation for the construction of sailing ships for practice. We understand now that the Superintendent of Annapolis advocates them on the ground that to sail such ships gives the cadets "nerve." We had an impression that there was no great scarcity of "nerve" in that quarter; but if there is, how would it do to cultivate it by requiring four hours out of twelve to be passed down in the bowels of a naval vessel? Some nerve is required for that.

We have said that to recommend sailing ships for practice in these days of steam was as ridiculous as to use bows and arrows for infantry practice, and in this connection it may not be uninteresting to quote from the English naval and military journal, "The Broad Arrow," which in turn quotes from the "Vedette" as follows:

"After the unfortunate issue of the war against Japan, it was suggested to the Emperor of China that it was high time for doing away with the ancient practice of subjecting candidates for appointment as military mandarins to an examination in archery, and the Emperor thereupon instructed the Secretary of State for War to send in a report on the subject. As might be expected in China, the Secretary reported in favor of retaining the archery test, stating as a reason that 'it would be dangerous to the safety of the country to put firearms into the hands of so many young men.' Of course, the Secretary failed to comprehend that it would be still more dangerous for the safety of the country to give the command of troops to mandarins who are not properly acquainted with modern arms."

We may laugh as we please at the Chinese Secretary of War, but at Annapolis, and on the quarter-decks of our naval vessels, are to be found ideas just as ridiculous, entertained by men highly educated and thoroughly informed, but absolutely blinded by their fixed determination not to see and not, if they can prevent it, to allow anyone else to see that steam

power has changed things in naval affairs as well as in other departments of human life.

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Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer questions by mail.

(197) G. H., New Jersey, asks: Can you give me a receipt for hardening cast iron by heating and dipping in a bath? A.—Cast iron can be hardened by heating, then applying prussiate of potash, again heating, and quenching in water. Sometimes it is advantageous to repeat this operation one or more times.

(198) F. S. F., New York, N. Y., asks: What is the best way to temper cones and ball races for bicycles for a repairman who only makes one or two at a time? A.—We should say that the best way would be to heat them in a clean coal or charcoal fire, carefully and evenly, and quench in water, then draw the temper, or, if preferred, they can be quenched in oil.

(199) H. C. W., Camden, N. J., asks: What is the highest safe speed at which a bearing with ½-inch balls traveling in a circle 18 inches diameter, each ball loaded to 350 pounds, could be run, or would the speed not enter into the question of safety? A.—We referred this question to the Ball Bearing Company, Boston, Mass., and they reply as follows: "The speed of revolution hardly enters into the question of safety in a ball thrust bearing. It does, however, very materially affect the durability of the bearing, and with a load of 350 pounds per ball (which we consider excessive for ½-inch balls) on a diameter of 18 inches, we should hardly advise your correspondent to run his bearings more than two or three hundred revolutions per minute."

(200) F., Camden, N. Y., asks: How can the lead bath used for heating steel pieces for tempering be used so as to prevent it from wasting away? I have to be continually skimming it off on top in order to keep it clean. A.—Cover the surface of the lead bath with charcoal. 2. What solution can I use to prevent rust on articles made of steel wire? I cannot use vaseline or paint, nor "Manocitin," nor anything of the sort, but would like to get hold of something that I can use in solution and dip the pieces. A.—Perhaps lime-water will answer. Articles of iron or steel submerged in water in which lime has been dissolved do not rust, and when taken from the water and allowed to dry the thin coating of lime over them prevents rusting, but it is, of course, easily brushed off by handling.

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Business Specials.

Transient Advertisements 40 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Gear wheels, gear cutting. Grant; see page 14.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Ct.

Milling Machs. Kempsmith Co., Milwaukee, Wis.

Ideal Twist Drill Grinder. T. Hall, 853 B'way, N.Y.

Engine Castings ⅛ to 2 H. P. Finished boilers and engines. Grant Sipp, Paterson, N. J.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N.Y.

Patent Soliciting of High Class.—D. Walter Brown, Counsel in Patent Cases, 111 Broadway, New York. Send for "Brief History of Patent Legislation."

Commercial Review.

NEW YORK, SATURDAY EVENING, Nov. 21st.

THE BUSINESS SITUATION OF STEAM POWER MACHINERY.

A question now incumbent upon us to answer is: "Has the Election resulted in a radical change in business for the better?" To this it must be replied, that, in respect to the engine and boiler market, at least, there is nothing as yet which suggests an avalanche of trade. If there are any sellers who expected, upon entering their offices on the morning of Wednesday November 4th, to find their desks covered with orders, they are sadly disappointed men; in fact, there is in the market a perceptible undertone of disappointment. But in spite of this, signs are manifest of a gradual improvement in trade.

It is not hard to find sellers whose actual business is increasing; and the statement is of broad application, that while the number of contracts actually closed up is as yet insignificant, the inquiries tentative to future work, and the prevailing opinion that business is bound to improve, create a hopeful sentiment in machinery. We may as well banish from our minds at once the idea that trade is going to exhibit itself in a pyrotechnic manner.

Those who deal in steam machinery consider it a slow branch of the market to respond to the influences of awakening activity. It is now rather early to look for results; capital must first be obtained by those who intend to buy; and furthermore, there exists a widespread opinion that we must wait until after the holidays, and perhaps until spring, before very much business shows itself.

Some new contracts are reported, of which it is distinctly stated that they were placed on account of the Election. We should perhaps look to mills and factories for the most important results of returning confidence, and an improved disposition on their part to purchase steam power machinery is acknowledged to exist. People who have held back on repairs and extensions are beginning to show that they are ready to go ahead with the work. New enterprises are, as yet, in the background. A favorable sign mentioned by one house is that a number of small buyers—those who want engines of 10 or 12 horse-power—are looking around with the idea of investing.

Inquiry among a few of the steam appliance and specialty men indicates that these lines of goods have hardly yet begun to move. One explanation offered for it, and which has also been suggested as partly explanatory of the sluggishness of the engine market, is that buyers are disposed to avoid expenditures for more stock until after inventory time. One valve company, indeed, say that there is an improvement in business, but that they find collections decidedly poor; another, that there is some improvement, but not what was anticipated. An advance has been made in the prices of wrought-iron pipe.

If the current newspaper reports of renewed activities are swallowed without some seasoning of explanation, they are likely to convey an erroneous impression. Among the multitudinous omens of good times heralded by the daily press soon after Election was the resumption of work by a certain engine shop in this State. Inquiry at its office in this city shows that there has been little or no increase in the actual business. A Pennsylvania concern, who make engines and other machinery, were stated to have started up; but in engines, at least, things are reported dull at their local headquarters. Another engine-building establishment, situated in Ohio, is said to be building eight engines now to one before the Election—though we are not aware that this has gotten into the daily papers—but the purpose, we are told, is to accumulate stock to supply the orders that are going to come in the future.

Now, we would not for one moment deny the significance of the newspaper reports of awakening industrial life. We accepted them at once as precursors of better times, and as such we still regard them. We merely have been trying to define the actual status of a single class of merchandise, and perhaps it is not one which most favorably illustrates the general situation. Among the reported resumptions of manufacturing establishments, only a trifling proportion of the engine and boiler shops in the country have been included. Again, we speak in great measure from the New York standpoint, and perhaps our readers in other parts of the country may have more favorable views to present; if so, we shall be glad to hear from them.

We mentioned in our last monthly report that the Solvay Process (soda ash) Company, of Syracuse, had purchased 2,300 horse-power of boilers to add to their plant. Now comes the very encouraging statement that their business has doubled since the Election, that two days ago they were 1,000 tons behind in the output of their product, that 800 horse-power more of boilers is being shipped to them, and that they are contemplating the purchase of another 800 horse-power.

Finally may be given one or two of the more hopeful business opinions we have heard. The selling representative of a prominent high-speed engine company remarks in substance: "There is no rush yet, but prospects are bright, there being an excellent inquiry. And in our export trade there is improvement. We ship engines to Japan, China, South America, etc." The following, spoken on behalf of a steam pump company (we do not attempt to offer a general statement as to the pump market), is philosophical: "The results of the Election are felt in this way, that enterprises which were hung up till

after it are beginning to move. The feeling is improved, and we are expecting business before long; but as yet we have no more of it than in the few weeks preceding Election. The pump market feels an improvement later than some others, because it deals with a class of work which is auxiliary to others. There is not a boom, and we are glad that there is not, for a boom is not a healthy thing."

EXPORTS OF MACHINERY

from the port of New York of which manifests have been given out during the week ending November 21st we compute at $342,000. The word "machinery" is here made to include a number of items which were formerly excluded when separately listed: e. g., engines, boilers, typewriters, sewing machines and pumps.

Quotations.

NEW YORK, Monday, November 23d.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$12 50 @ $13 00
No. 2 foundry, Northern	11 50 @ 12 00
No. 2 plain, Northern	11 25 @ 11 50
Gray Forge	11 00 @ 11 50
No. 1 foundry, Southern	12 25 @ 12 50
No. 2 foundry, Southern	11 50 @ 11 75
No. 3 foundry, Southern	11 00 @ 11 25
No. 1 soft, Southern	11 75 @ 12 00
No. 2 soft, Southern	11 25 @ 11 50
Foundry forge, or No. 4 Southern	10 75 @ 11 00

Bar Iron—Base—Mill price, in carloads, on dock; common, 1.15 @ 1.20c.; refined, 1.25 @ 1.50c. Store prices: common, 1.40 @ 1.50c.; refined, 1.50 @ 1.80c.

Tool Steel—Ordinary sizes, standard quality, unchanged at 6 @ 7c., with some brands perhaps a little less; extra grades, 11 @ 12c.; special grades, 16c and upward.

Machinery Steel—Ordinary brands, from store, 1.70 @ 1.80c.

Cold Rolled Steel Shafting—Base size in carloads, about 2½c.; 2¾c. for smaller quantities from store.

Copper—Carload lots, Lake Superior ingot, 11½; electrolytic, 11¼ @ 11⅝c.; casting copper, 11⅜ @ 11¼c.

Pig Tin—For 5 and 10-ton lots, 13.00 @ 13.10c., f. o. b.

Pig Lead—In carload lots, 2.97½ @ 3.0'c., f. o. b.

Spelter—In carload lots, New York delivery, 4.15 @ 4.25c., f. o. b.

Antimony—Cookson's, 7¼ @ 7½c.; Hallett's, 6½ @ 6⅝c.; Japanese, 6¼ @ 6⅝c.

Lard Oil—Prime city, present make, commercial quality, in carload lots, 42 @ 45c.

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Manufactures.

D. J. Ames, of Philmont, N. Y., is to erect an addition to his needle factory.

At Owensboro, Ind., a new cellulose factory is to be built at a cost of $150,000.

F. Blumenthal & Co.'s plant at Wilmington, Del., is to be considerably increased.

It is the intention of Mr. Will Johnson, of Brandon, Vt., to erect a machine shop.

Mr. W. H. Pelkey, Fair Haven, Vt., will build a new machine and blacksmith shop.

Eaton Rapids, Mich., will erect and thoroughly equip a lighting plant at a cost of $30,000.

An annex, 40 x 100 feet, is being built at Sternbergh & Son's rolling mill, Philadelphia, Pa.

Jonas & Co., Minotola, N. J., will probably soon commence the erection of another glass factory.

The Franklin & Megantic Railroad Company propose building an engine house at Carrabasset, Me.

George Brouse, American and Morris streets, Philadelphia, Pa., is to build a planing mill, 45 x 55 feet.

H. & S. Z. Kalbach, Lebanon, Pa., will erect a bicycle factory, and place new and improved machinery.

William Estey, Laconia, N. H., is putting up a building on his property to be used as a brass foundry.

At Chester, Pa., the Consumers' Ice Company contemplate enlarging the capacity of its ice making plant.

It is said that a factory is about to be erected by Sterling, Welch & Co. on East Prospect street, Cleveland, O.

Mr. Wm. Ross, of Sarnia, Canada, contemplates a factory to manufacture a wooden frame bicycle in that town.

The Columbia Rolling Mill Co., Columbia, Pa., are making large improvements, and will install new machinery.

The National Chuck Company are to occupy a five story brick factory at 116-124 Pearl street, Brooklyn, N. Y.

Andrews & Co., Ald, Mass., are to erect a new building on Bartlett street, that town, for manufacturing purposes.

Lay & Balcom Manufacturing Company, Port Allegheney, Pa., will install machinery for manufacturing woodenware.

It is reported that a factory is to be built at Lemont, Ill., to engage in the manufacture of agricultural implements.

The Mt. Clare shops of the B. & O. R. R., at Baltimore, Md., are to be rearranged and considerable new machinery installed.

John Campbell is about to build a two-story brick and stone mill building, 40 x 100 feet, at Frankford Junction, Philadelphia, Pa.

The Indianapolis Abbatoir, Indianapolis, Ind., is building an addition to its plant, which will contain all modern appliances.

The Fore River Engine Company, East Braintree, Mass., is to erect a plant suitable for building yachts of 100 feet water line.

Thomas West, proprietor of the Wyoming Valley Knitting Mill, Plymouth, Pa., will build an addition to his mill on Shawnee avenue.

The New Wilmington (Pa.) Electric Light Company will install a large amount of new machinery, including new engine and dynamo.

Alexander Lynes is to put a new boiler into his mill on Hunnewell street, Natick, Mass. It will be placed in an addition to be built.

The Merchants' Warehouse Company, Dubuque, Ia., capital 500,000, will erect several large elevators and equip same with modern machinery.

The New Butler & Pittsburgh R. R. have secured a site on the Allegheny Valley Road, Pittsburgh, Pa., on which to erect car and repair shops.

A wire mill will be erected at Norristown, Pa. Mr. J. F. Jaquith, of Philadelphia, Pa., is interested and will erect a factory in that city also.

It is expected that a glove factory will be built at Lyons, N. Y., in the near future. Mr. Samuel Roe, of Elbridge, N. Y., is interested in this enterprise.

Plans have been submitted for the mill to be erected at Cooper Hill, Col., by the Carbon County Company. The machinery will be inclosed in a building 60 x 64 feet.

The Mathieson Alkali Company, of New York city, is to build a large factory at Niagara Falls, N. Y., in which to manufacture caustic soda, by the new electrical process.

The Split Pulley Works, Chattanooga, Tenn., are contemplating the rebuilding of their plant, which was burned several months ago. It will probably be in operation by January 1st.

The refining capacity of the plant of the Standard Oil Company at Constable Hook, N. J., is soon to be greatly increased, if not doubled. Work has already begun on the new buildings.

The Friction Pulley Company, Sandy Hill, N. Y., are building an addition to their machine shop, 104 x 40 feet and two stories in hight, and an addition to their foundry of 30 x 40 feet.

W. A. Haines, Ft. Fairfield, Me., has his new mill on the Fisher brook up and enclosed. It is a large building. Mr. Haines intends to put in a planer and various other kinds of machinery.

The Golley & Finley Iron Works, on the southwest corner of Main and Eureka streets, Lima, O., manufacturers of drilling and fishing tools and boilers, were destroyed by fire recently.

Marcott & Hayes, Randolph, Vt., are building a new grist mill, with the idea of putting into the old mill machinery for making inside h use finishings and doing some other custom work.

Messrs. Francis Frost & Co., of Toronto, paint manufacturers, contemplate erecting a three story factory at Niagara Falls, N. Y. It will be built of brick and iron, and will cost about $15,000.

The York Card & Paper Company, York, Pa., has increased working hours and employed more men. They will at once erect a four-story addition, employing 350 more men, making a total of 660.

Carpenter & Co., West Bay City, Mich., will erect a saw mill to replace one recently burned. Im-

(Continued on page 37.)

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Help Wanted.

Situation and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

TO SUBSCRIBERS

whose names appear on our subscription list, this paper will give two free insertions under this heading to those in want of positions. The advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

Mech'l d'ftsman wants pos. Box 181, AM. MACH.

Help Wanted—Good pay for leisure hours. Geo. W. Lord, Philadelphia, Pa.

Competent draftsman wants position; 10 years' experience; references. Box 170, AM. MACHINIST.

Draftsman, technical graduate, exp. in shop and drawing room, wants position. Box 178, AM. MACH.

Experienced mechanical draftsman wants position; best references. Box 182, AMER. MACHINIST.

Wanted—Position by foreman boiler maker; make estimates; a hustler. Address Box 183, AM. MACH.

Wanted—Reliable men to sell the "Columbia" Calipers; liberal com. E. G. Smith, Columbia, Pa.

Wanted—Pos. as foreman boiler maker; has had large exp.; a hustler; A 1 refs. Box 185, AM. MACH.

Wanted—An up-to-date boiler maker on marine work to act as foreman. Address Phœnix Iron Works, Port Huron, Mich.

A first-class pattern maker wants position; a young man with experience on machine tools, etc. Box 154, AMERICAN MACHINIST.

Wanted—Position as gen'l foreman by thorough machinist; experienced manager, piece work and prices and estimates. Box 175, AMER. MACHINIST.

A technical graduate with 10 years' shop and drawingroom experience, would like a pos. as ass't sup't with growing concern. Box 165, AM. MACH.

Machinist and draftsman, 28, 14 years' general experience in shop, outside work, engines, boilers and elevators wants position; references; able to take charge. Box 176, AMERICAN MACHINIST.

Mechanical engineer wishes to change; qualified in managing help, 15 yrs.' exp. as machinist and designing of marine & stationary engs., power plants, general and special machy. Box 159, AM. MACH.

Reliable draftsman, quick and neat, 9 years' drawing room and shop experience, college education, speaking English, German, some French, desires change; good refs. Box 184, AM. MACHINIST.

Gun and locksmith wanted in a Montana city; must be a first-class mechanic, thoroughly experienced and a man of deeds, not words; give experience, age, references and wages wanted. Address L. G., AMERICAN MACHINIST.

Wanted—By an up-to-date machinist who has had 20 years' experience, situation as foreman or assistant superintendent; has had experience in handling men with good results; best of reference. Box 152, AMERICAN MACHINIST.

Assayer and Draftsman—Position open West for an energetic technical graduate, as assistant engineer to manager; great variety of work outside and in office; give references, age and experience. Address L. G., AMERICAN MACHINIST.

Foreman would like to correspond with Corliss engine builder who wants foundry foreman; experienced in all branches of the business; good references; will pay personal visit if desired; write for particulars. Box 160, AMERICAN MACHINIST.

Supt., 17 years' exper.; 5 in ch'g tool and gauge rooms, 8 supt., Corliss engs., gen. machy., interchangeable wk., ingenious, foundryman, designer, advanced pusher, 34, married, temperate, will change December 1. Box 153, AMER. MACHINIST.

Wanted—Position as foreman or superintendent with cycle manfg. company; good designer and d'ftsman and extensive mechanical abilities, latest methods for producing at lowest costs; 18 yrs.' exp. in gen. tool work; A 1 refs. Box 158, AM. MACH.

Wanted—Position as superintendent of bicycle manufactory; 19 years' experience; practical machinist and tool maker; can design tools, jigs, etc.; also have had large experience building typewriters, etc. Address Box 150, AMER. MACHINIST.

Wanted—A technically educated steam engineer experienced in designing, se ling and erecting power and lighting plants. Applicants will kindly forward outline of exp. a d refs., as only those with records will be considered. Box 156, AMER. MACH.

Position wanted as superintendent or manager; thorough mechanic, 15 years in business for himself; knows how to systematize and produce work cheaply; can bring about $15,000 per year in new work. Address Machinist, care AMER. MACHINIST.

An experienced engineer is open to engagement where ability and well-directed push can be made advantageous to both parties; refers to many well-known engineers; graduate of Cornell; member of American Society of Mechanical Engineers. Address Box 174, AMERICAN MACHINIST.

Sit. wanted by an energetic American as master mechanic with a manfg. concern having own machine repair shop; technically educated; experience, 3 years drawing room, 3½ years mach. shop; familiar with factory and mill work; present sit. as master mechanic, 2½ years. Box 172, AM. MACH.

The undersigned would be pleased to correspond with manufacturers requiring the service of a hustling superintendent of practical abilities and extensive experience in the manufacture of dynamos, motors and general machinery; salary or contract acceptable; prefer the latter. Box 180, AM. MACH.

Wanted—Paper maker in large paper mill; thoroughly competent paper maker to assume entire charge of mill. Only those need apply who have held similar positions and had extended practical experience in the control of men and expert in the running of paper machinery, with full particulars, by mail only, P. M. Remington Bros., 309 Broadway, New York.

Wanted Superintendent, by a large manufacturing company near New York, a thoroughly capable man to assume entire charge of a department at its works. Only one possessing energy, executive ability and experience in organizing and maintaining a large force of employés need apply, with full particulars and references, by mail only, "Ability," Remington Bros., No. 309 Broadway, New York.

A practical machinist and foundryman now holding position as general supt. with a company employing 400 men, desires to make a change; is perfectly familiar with modern mach. shop and f'ndry practice; makes mixture of iron for cupola from analysis; good reasons for desiring a change, and desires to correspond with some company wanting a practical superintendent. Box 173, AM. MACH.

Owing to a consolidation of business, a successful mechanical superintendent will be at liberty January 1st. Experienced in general shop and business management, costs, interchangeable work, tools, gauges, etc.; also general machinery and brass and iron work for steam, gas and water; strictly temperate and reliable; eight years in present position. Add. Box 168, AMER. MACHINIST.

A thorough machinist, age 36, who has been engaged in the machine and foundry business, desires to connect himself with some reliable firm where ability and push will count; well up in modern shop methods and management; can handle men, make drawings, solicit business, make contracts or handle correspondence; can give unqualified references as to character and ability. Box 179, AMERICAN MACHINIST.

Representatives for New York and Chicago Wanted—Two thoroughly competent solicitors to represent and advocate work for a machine shop (cap. 250-300 hands) that is equipped with the finest modern implements and prepared to do general machine work, especially in the line of automatic machinery, labor-saving machines, tools, work of precision, etc., under contract or regular shop rates; must be practical men with unlimited experience and able to give estimates; only A 1 men with A 1 references need apply. Address Box 177, AMERICAN MACHINIST.

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Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d h'd lathes & planers. S. M. York, Clev'd, O.

Calipers & Gauges. F. A. Welles, Milwaukee, Wi

Engine castings, 2½ x 3 inches, complete, $5.00. Box 105, Millington, N. J.

Best and cheapest Bolt Header, made by Baush & Harris Machine Tool Co., Springfield, Mass.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

For Sale—Second-hand drill presses, engine lathes & planers. Dietz, Schumacher & Boye, Cincinnati, O.

We make a specialty of Shartle's patent safety set collars. Prices low and samples free. Middletown Machine Co., Middletown, Ohio.

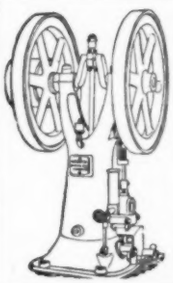
We offer an exceedingly fine lot of first-class second-hand machinery, lathes, planers, shapers, drills, millers, screw machines, etc. Call, or get list 17 B. The Garvin Mach. Co., 440 Canal st., N. Y.

Wanted—An Idea. Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write John Wedderburn & Co., Patent Attorneys, Washington, D. C., for their $1,800 prize offered to inventors.

CURTIS & CURTIS,

66 Garden St., Bridgeport, Ct.

Send for Illustrated Catalogue



This beats Wind, Steam or Horse Power.

We offer the

WEBSTER 1 1-2 ACTUAL HORSEPOWER

GAS ENGINE

For $150, less 10 per cent. discount for cash. Built on the interchangeable plan. Built of the best material. Made in lots of 100, therefore, we can make the price. Boxed for shipment, weight 800 pounds Made for Gas or Gasoline.

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SCHOOL OF MINES,
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SCHOOL OF ENGINEERING,
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Four years' undergraduate courses and special facilities for graduate work in all departments. Circulars forwarded on application to the Secretary of the University.

Automatic Solid Die Bolt
THREADING MACHINES.
Two Styles. Four Sizes
Send for Catalogue "A."
WEBSTER & PERKS TOOL CO.
Cor. Spring and Monroe Sts.,
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STEEL SPIRIT LEVELS.

Light, strong, accurate, wide face, nickel-plated. A wise mechanic will buy no other. Catalogue of tools on application.

SAWYER TOOL CO.,
ATHOL, MASS.

(*Continued from page 30.*)

proved lumber manufacturing machinery, engine, pumps, etc., at a cost of $45,000, will be installed.

The West Side Water Company has been organized at New Castle, Pa., by Stewart Thompson and Henry Wettich. They intend to build a plant of the most improved type, and will place machinery.

The United States Seamless Tube Company, organized by some of the members of the National Tube Works Company, McKeesport, Pa., has plans prepared for the erection of a new plant at that place.

Work will soon be commenced on the construction of the plant of the Chicago Rolling Mill Company, Chicago, Ill. Several acres of ground at Chicago Heights will be covered by the buildings and yards.

The firm of Rumsey & Co., of Seneca Falls, N. Y., will increase the capacity of their pump and fire apparatus plant at once. The buildings are to be enlarged and new and improved machinery added.

Messrs. Walker & Baindley, of the Erie Specialty Co., Erie, Pa., intend to erect an additional story to their factory. When completed this addition will be equipped with new machinery at a cost of $10,000.

The Glen Willow Ice Manufacturing Company, Philadelphia, Pa., will improve its plant. A one-story brick addition, 41 x 114 feet, to the present building will be erected, and a 100-ton ice machine installed.

The New England Knitting Company is erecting a large dye house at Winsted, Conn., and C. F. B. Berdig, of New York city, is building a factory at the same place, for the manufacture of silk cords and tassels.

The Murch-Davis Cycle Manufacturing Company, Chicago, Ill., has been incorporated to manufacture cycles. A large plant will be erected and thoroughly equipped to manufacture high grade wheels; $100,000 capital.

Building Inspector Spencer to-day issued a building permit to J. J. Hogan, proprietor of the Hogan Nail Company, Erie, Pa., for an addition to the factory on Cascade, between Seventeenth and Eighteenth streets.

The Briggs Carriage & Car Company, Amesbury, Mass., one of the largest concerns of the kind in New England, is arranging to start up its works immediately. Workmen have been put at work enlarging the plant.

Joseph A. and C. A. Baker, Philadelphia, Pa., and W. S. Williams, of Beverly, N. J., are the incorporators of a new sugar refinery which is to be built at Camden, N. J. Machinery of the most improved type will be installed.

The Crown Cork & Seal Company is erecting a large building at Girard street and Guilford avenue, Baltimore, Md. The building with machinery will cost about $50,000. Mr. Joseph Friedenwald is president of the concern.

In our issue of October 1st we published an item to the effect that the Reners Drop Forge Co., Revere, Mass., would erect an addition to their plant. This name should have been given as the Revere, not Reners, Drop Forge Co.

Wilson Bros., Louisville, Ky., composing the Greenup Milling Company, have decided to rebuild their flour mill recently destroyed by fire. It will be a 50-barrel mill and will be equipped with the latest improved machinery.

The plant of the Boston Bridge Works, situated on Sixth street, East Cambridge, Boston, Mass., was totally destroyed by fire, entailing a loss of about $150,000. The company will rebuild. New machinery will be installed.

The Mountain City Mills, Chattanooga, Tenn., will soon close down to make extensive improvements on their plant. The machinery will be thoroughly repaired and a large addition made to the present capacity of the mills.

A machine shop is being erected on Marginal street, near Jeffries street, East Boston, Mass. It is 75 x 136 feet, and will give employment to about

60 men, making a specialty of marine work. The shop is being built by J. H. Long, Fort Hill square.

A. J. Chase & Son, of Sebec Station, Me., have the frame for their steam mill up and nearly covered. The main building will be 24 x 100 feet with an annex 30 x 30. The engine house will be 24 x 30. There will be a saw mill, grist mill and a rotary saw mill for large lumber.

The Walker & Pratt Manufacturing Company, which now has its foundry on Galen and Main streets, Watertown, Mass., has purchased another large tract of land near the rubber works, and intends to build a model stove foundry there, increasing its present capacity largely.

A company composed of David Blackley, John Hoodless, J. H. Tilden, C. S. Cochran, Ald. Brown and Dr. Clark has been organized to manufacture bicycles, under the style of the Excelsior Bicycle Co., and will locate in the old Burns-Robinson building, Mary street, Hamilton, Ont.

At the annual meeting of the shareholders of the Saw Bill Lake Gold Mining Company, recently held at Hamilton, Canada, it was decided to at once secure stamp mills and other mining plant; also a saw mill to cut their own lumber. Mr. J. H. Tilden was elected president and H. N. Kitson secretary and treasurer.

The Hendey Machine Co., Torrington, Conn., are contemplating running their new shop building by electricity. They have not yet decided what system they will use, but are looking into the subject. They have installed their new 100 H. P. boiler and are to put in a new large engine and dynamo. Their power plant is to be reorganized.

A new electric manufacturing company, which will make electric pumps, motors, propellers with rudder combinations for pleasure boats, graphophones, electric fans and batteries for power and other purposes, is to immediately erect a plant in East Braintree, Mass. New machinery for the manufacture of the same is to be installed.

Mr. H. Peck, of New Westminster, British Columbia, has secured a site and will at once commence the erection of a new iron works in that city. The erecting shop, machine shop, blacksmith shop and foundry will each be 23½ x 66 feet. The whole will be steam heated and lighted by electricity. The main building will have a traveling crane.

The Berlin Iron Bridge Company, of East Berlin, Conn., are putting up a new machine and blacksmith shop for the Robert Palmer & Son Shipbuilding Company, of Noank, Conn. The same company are furnishing a rolling mill for the Rome Brass & Copper Company, of Rome, N. Y. Also a new power house for the Plattsburgh Light, Heat & Power Company, of Plattsburgh, N. Y.

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New Catalogs.

There are three sizes of Standard Catalogs, first authorized by the Master Car Builders' Association, 9" x 12", 6" x 9" and 3½" x 6". We recommend the 6" x 9" size for machinery catalogs. When they must be larger or smaller, one of the other standard sizes should be adopted if possible.

Mason & Mason Co., Chicago, Ill., send us a catalog containing illustrations and descriptions of the "Soudan," "Nile" and "Pyramid" bicycles. It is 5¼ x 7¾ inches.

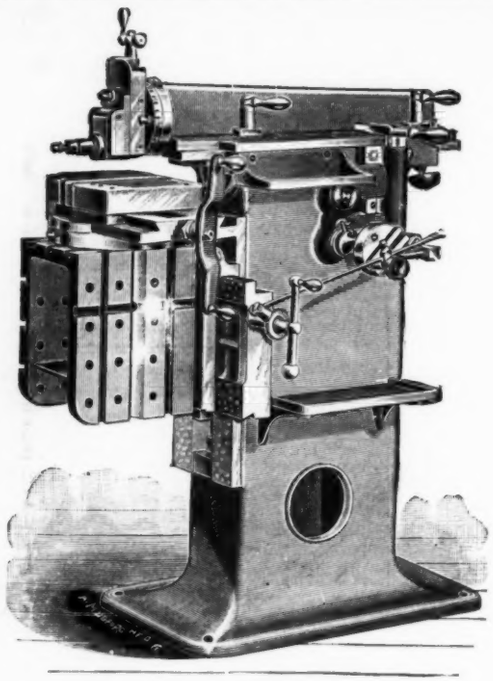
Hamilton Machine Tool Co., Hamilton, O., send us a catalog containing illustrations and descriptions of various styles and sizes of drill presses. The catalog is 6¼ x 9¼ inches.

The Phœnix Iron Works, Cleveland, O., send us an illustrated catalog of cranes (driven both by steam and belt-power), crab winches, turntables, etc. The catalog is 6½ x 9½ inches.

The Old Fort Mfg. Co., Fort Wayne, Ind., send us catalog for 1896-97, containing illustrations of wood bicycle rims, guards, handle bars, etc., manufactured by them. The catalog is 3½ by 6 inches.

The Garvin Machine Company, New York, send us a catalog containing illustrations of various

(*Continued on page 39.*)



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15-inch Hendey Shaper.

Latest Improvements.
Useful Attachments.
Strong and Powerful.

...FOR...

Die Work, Tool Room or General Shop Work.

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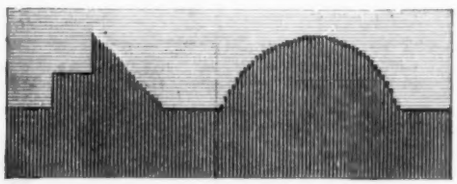
The stroke can be adjusted for curves with machine in motion. The stroke can be adjusted for angles with machine in motion. The stroke can be adjusted for irregular work with machine in motion. It has adjustable table for planing taper work; table can be removed for fastening work to apron. Has a strong graduated swivel vise. Quick work, rapid changes, modern ideas.



This cut shows how stroke can be adjusted with machine in motion by micrometer; adjustment fine and delicate. SEND FOR CIRCULAR.

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THE HENDEY MACHINE CO.

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EUGEN SOLLER, Basel, Switzerland.

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...MAKERS OF...

Fine Machine Tools.

Complete Plants furnished for Bicycle, Typewriter, Gun and Sewing Machine Makers. Gauges and Small Tools for all Machine Work. Drop Hammers and Trimming Presses. Forging and Trimming Dies for all classes of work.

England—Buck & Hickman, 280 Whitechapel rd., London, E.; Chas. Churchill & Co., Ltd., London and Birmingham. *France*—F. G. Kreutzberger; Fenwick Freres & Co., 21 Rue Martel, Paris.
Chicago—42 and 44 S. Clinton st. *Boston*—281 Franklin st. *New York*—123 Liberty st.

Finest Machine Relieved Taps and Adjustable Tap Wrenches IN CASES.
SCREW PLATES, DIES, &c.
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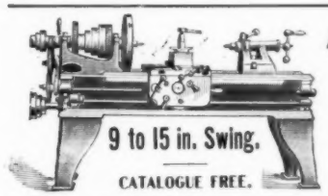

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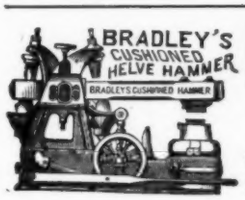

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(Continued from page 38.)

kinds of machinery used, especially in the manufacture of bicycles. The catalog is 5 x 6¾ inches.

We have received from E. G. Smith, Columbia, Pa., two small pamphlets devoted to the illustration and description of "Columbia" Vernier calipers, micrometers, rules, etc. They are 3½ x 6 inches.

Goodell Bros. Co., Greenfield, Mass., send us their Catalog No. 1, which contains illustrations and descriptions of hand drills, drill chucks, ratchet braces, and other tools used by machinists. Standard size, 6 x 9 inches.

Hendey Machine Co., Torrington, Conn., send us a catalog for 1896, which contains illustrations and descriptions of lathes, shapers, planers, etc. The catalog also contains a telegraphic code for use in ordering from them. It is 6 x 9¼ inches.

We have received from the E. Horton & Son Co., Windsor Locks, Conn., catalog devoted to the illustration and description of lathe and drill chucks made by them. These chucks are made in various styles and sizes. The catalog is 4¾ x 7¼ inches.

The Geometric Drill Co., New Haven, Conn., send us catalog illustrating and describing their system of geometric boring and turning, together with price-lists of tools used for this purpose, and made by them. The catalog is standard size, 6 x 9 inches.

The Champion Rivet Co., Cleveland, O., have issued a small pamphlet entitled "Scientific Facts About Rivets," which contains the results of various tests of rivets, such as pulling and bending. The pamphlet will be useful to those interested in the subject, and is 5 x 7¾ inches.

We have received from the Automatic Friction Clutch Company, Erie, Pa., a catalog containing illustrations and description of the Automatic Friction Clutch and Cut-off Coupling manufactured by them. It contains sectional views of the different parts of the clutch, and is 4½ x 6 inches.

The Carborundum Co., Niagara Falls, N. Y., send us catalog containing description of carborundum, an abrasive material, the above company being the sole manufacturers of it in the United States, and which can be used in almost all kinds of polishing and grinding machinery. The catalog is 6¼ x 9 inches.

The St. Louis Iron and Machine Works, St. Louis, Mo., send us catalog giving illustrations and description of the "Heavy Duty St. Louis Corliss Engine," built by them. Exterior and interior views of the shop, in which these engines are built, are given, and the catalog is standard size, 6 x 9 inches.

We have received 1896 catalog of L. Best, 45 Vesey street, New York City, which contains illustrations and descriptions of various kinds of polishing and grinding machinery, particularly those machines made by the Sterling Emery Wheel Co., for which company Mr. Best is New York selling agent. It is 6 x 9¼ inches.

We have received from the Sipp Machine Works, Mill street, Paterson, N. J., a catalog devoted to the description and illustration of small engines and boilers, model locomotives, etc. The catalog is standard size, and is mailed on receipt of ten cents, this amount being refunded on first order amounting to one dollar.

Ranken & Fritsch Foundry & Machine Co., St. Louis, Mo., send us a catalog devoted to the illustration and description of Corliss engines manufactured by them. It contains excellent half-tone pictures of several of these engines now in use, and also engravings of the different parts of engines. The catalog is standard size, 6 x 9 inches.

Baker Bros., Toledo, O., have sent us "catalog No. 3," which contains illustrations and description of the Colburn key-way cutter. Excellent half-tone pictures, also samples of work done on the machine, together with engravings showing the mechanism of the cutter are given. These machines are made in different sizes, and a list of users of them with testimonial letters are given. It is standard size, 6 x 9 inches.

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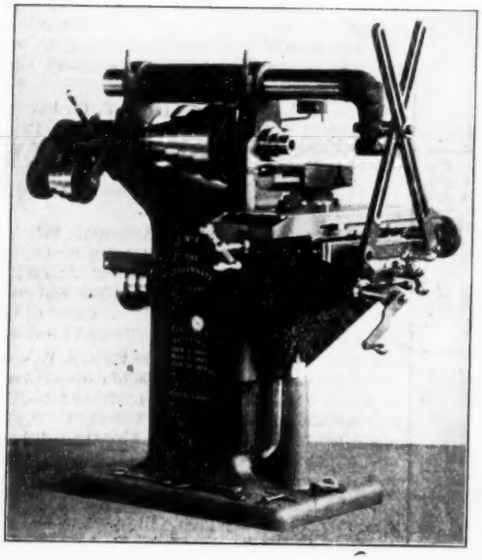

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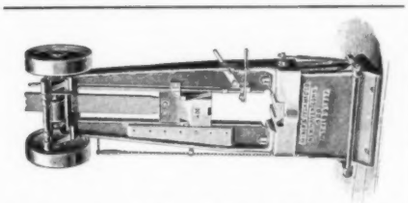

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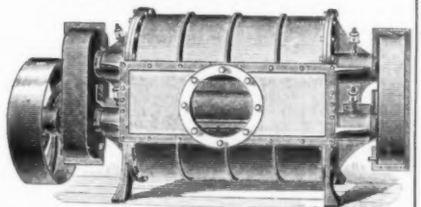

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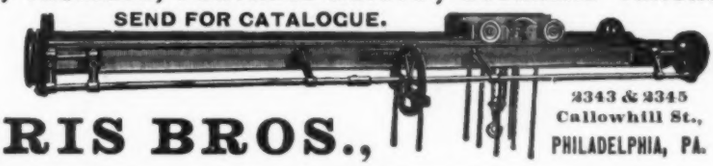

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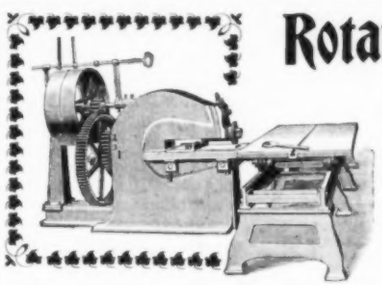

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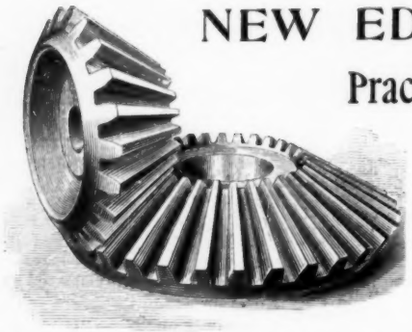

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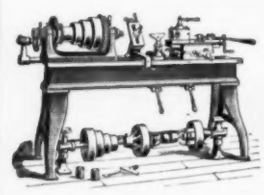

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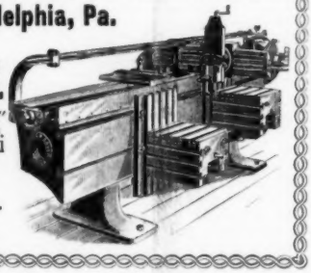

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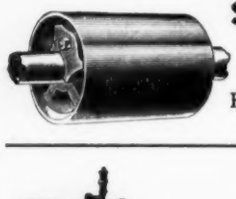

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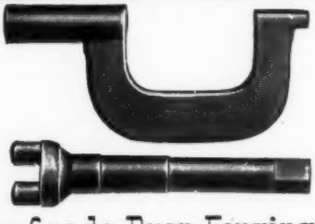

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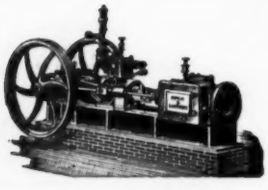

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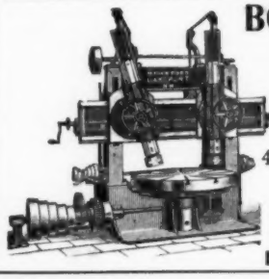

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